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THE MODEL ENGINEER

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5TH JUNE 1952 VOL. 106 NO. 2663

SMOKE RINGS

Our Cover Picture

● MODEL POWER boats are again in the news, and although the regatta season is still young, the activity already shown promises that 1952 will be a record year in every sense of the term. Several model speed boats have attained speeds of over a mile a minute, and the one shown in this photograph, Mr. E. Clark's *Gordon II*, which returned a speed of 70.1 m.p.h. in the 1951 " M.E." Speed Boat Competition, holds the British " A " class record. The characteristic attitude of the boat, with the outer sponson clear of the water, and the feature of the modern surface propeller, in creating tall columns of spray are clearly seen. Although boats have not yet attained speeds equal to those of model cars, they are certainly no less spectacular, and the finish to a run is never a foregone conclusion ; the owner, seen in the foreground, shows by his tense attitude that the element of suspense and apprehension is never absent. This photograph was taken by Mr. P. A. E. Mattingly at the opening regatta of the Victoria Model Steamboat Club on Sunday, April 13th.

Camp Coaches

● THERE ARE some kinds of holiday accommodation which are much less attractive and more inconvenient than a railway camp coach. We formed this opinion after inspecting two camp coaches recently, at the invitation of the Railway Executive.

No fewer than 89 coaches are being converted similarly to those which proved so popular before the war. The coaches, which accommodate six to eight people, will be located at or near some selected seaside and inland resorts, and can be rented for £5 5s. 0d. to £10 per week according to site and season.

Each coach is completely equipped with bed-linen, pillows, blankets, cutlery, crockery, table-linen, kitchen utensils and everything needed for cooking. The bunk beds are well sprung and fitted with hair mattresses.

We found the arrangements quite homely and surprisingly spacious and airy, and we have little doubt that the popularity of this kind of holiday accommodation will grow rapidly, as it did before the war. We understand that the regional allocation is : 10 Eastern, 24 Midland, 15 North Eastern, 10 Scottish and 30 Western. Applications for renting a coach should be sent to the Commercial Superintendent, British Railways, at the following stations, according to the area, or Region, in which the coach is required : Liverpool Street, Euston, Paddington, Waterloo, York or Glasgow Central.

Every effort is being made to have all the coaches available in time for the holiday season, and when ready they will be located at attractive districts in East Anglia, North Wales, the Peak District, the West Country, the South of England, the Yorkshire Coast and Dales, and in Scotland.

B.R. Locomotive Livery

● THE RAILWAY EXECUTIVE has announced that as a result of experience, and with the object of achieving greater legibility, the background colour for locomotive nameplates and number-plates in future will be black instead of red. We think that this will result in an improved appearance as well as greater legibility ; it is curious that a light background to a nameplate is seldom satisfactory.

The "Supreme"

● OUR RECENT note about the celebrated Fowler showman's engine *Supreme* has brought us a friendly letter from her present owner, Mr. John B. Lyndhurst, of Earnley, Sussex. He points out that it is not strictly correct to describe this engine as being of the "Big Lion" class; the last four engines built by Fowlers were larger than the "Big Lions" proper, and *Supreme* was the last of that magnificent quartet.

Mr. Lyndhurst tells us that *Supreme* will not be in steam this year, as she is dismantled for an overhaul; but if all goes well, she will be put to work next year. She has already been visited by a number of enthusiasts, and we have not the least doubt that, when she is once more in working order, she will attract many more visitors. We have noticed, on those rare occasions when a steam road locomotive is to be seen among the equipment at a fair, even if it is standing cold and idle, the road locomotive is one of the principal centres of attraction.

The Walsall M.E.S.

● WE HEAR from the hon. secretary, Mr. E. H. Page, 61, Brookhouse Road, Walsall, that a model engineering society has just been formed in that town, with headquarters at the Y.M.C.A., Station Street.

Meetings are held regularly each Tuesday at 7.45 p.m., and a section of the membership is now engaged on the installation of a "OO"-gauge electric model railway.

The society is under the chairmanship of Mr. M. E. Habershon, 43, Broadway, Walsall, while Mr. L. A. Jones, The Hobbies Shop, Wisemore, Walsall, is hon. treasurer. Either of these two gentlemen, or the hon. secretary will be pleased to supply any information to enquirers. We trust that the new society will meet with all possible support and success.

A Hastings Get-together

● A COMBINED meeting of model engineer societies was held at the Queens Hotel, Hastings, on a recent Saturday.

Present were representatives from Ashford and Kent Model Engineer Society, Brighton and Hove Society of Model Engineers, Eastbourne Model Engineers Society, Eastbourne Model Powerboat Club, Folkestone Model Railway Club, Hastings and District Model Engineers Society, Medway Model Engineers Society, Orpington Model Engineers Society, and the Uckfield Model Engineers Society.

On arrival, each of the 59 members present were given a tag giving his name, interest and society, and this helped considerably during the proceedings for recognition.

The meeting was opened by the president of the Hastings Society, Lieutenant Colonel A. G. Cargill, M.B.E., F.R.Ae.S. In welcoming the visitors he said he was sure there was something for us all to gain from the meeting and stressed the necessity of closer co-operation.

One of the main points of discussion was the organising of exhibition dates. Past experience had shown that there was no co-operation on this point, as there had been occasions when two exhibitions had been running during the same period, or so close, that societies concerned had lost a good deal of support. The meeting was generally agreed that it was rather late to take steps against this happening this year, but all were agreed that a meeting of two delegates from each society should meet early next year and arrange a programme of dates which would be suitable to all concerned.

A further point of discussion was the possibility of a club team trophy at local exhibitions to encourage club team support as well as individual support. A suggestion that clubs concerned should contribute to such a trophy was felt most inadvisable and was not approved. It was pointed out here that the suggestion was not for a combined trophy but separate trophies at each exhibition put up by the organising society. Members of the Medway Society said they had tried this method, but it did not encourage the expected support. Ashford members suggested that each club's championship awards be assessed at the end of the year with the trophy going to the club with most success. Orpington members were of the opinion that sectional competitions would prove more attractive, for example, locomotive trials, powerboat competitions, etc., as this would be a better form of competition and would give the winner more satisfaction. It was finally decided that this question could be discussed at the meeting of delegates early next year.

Other points of interest were discussed before the meeting adjourned to have a group photograph taken before tea.

At the resumption of the meeting at 6.45 p.m., Mr. R. A. H. Weight, an honorary member of the Hastings Society, gave a short talk on locomotives, illustrated with several photographs.

Photographic Competition Judges

● FURTHER TO the "Smoke Ring" published in our issue of April 24th, we have been advised that the panel of independent judges for the Railway Photographic Competition will consist of: D. S. M. Barrie, M.B.E., Public Relations Officer, Railway Executive; C. C. B. Herbert, Civil Engineers Dept., Railway Executive, President of the Leica Postal Portfolios, and A. L. M. Sowerby, B.A., M.Sc., F.R.P.S., Editor of *Amateur Photographer*.

We would remind readers that the competition is open to all photographers resident in Great Britain and Northern Ireland. The closing date is September 1st, 1952, and full details may be obtained from J. C. Flemons, 48, Boldmere Road, Eastcote, Pinner, Middlesex.

The Old Locomotive "Comet"

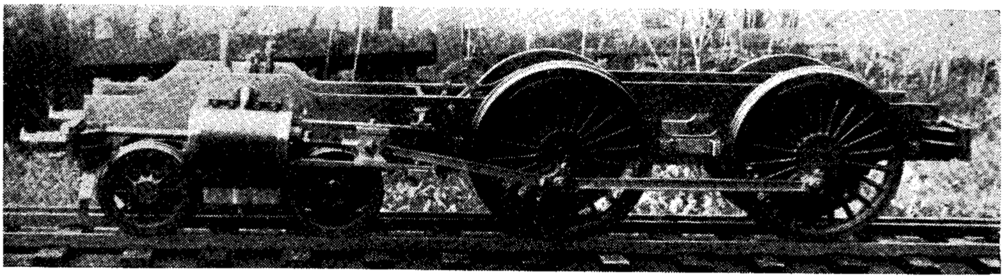
● IN OUR "Smoke Rings" for May 1st, when referring to the very interesting photograph reproduced on page 558, we inadvertently "allocated" the old Hawthorn locomotive *Comet* to the Liverpool & Manchester Railway. Actually, this very historic engine was built for the Newcastle & Carlisle Railway, and we are indebted to Mr. H. W. Davis, Hon. Curator of the Municipal Museum of Science and Industry, Newcastle-upon-Tyne, for pointing out our error.

Mr. Webb Builds a Compound !

by "L.B.S.C."

HOW'S *that* for a bit of startling news? Yes, it is literally true—but in case anybody thinks that a spot of spiritualism is responsible, let me hasten to assure all and sundry, that the 1952 Webb compound has nothing to do with the late Francis of that ilk! This is how it came about. Some two years ago, Mr. Arthur Webb, whose *Hielan' Lassie* is well known on the Birmingham club track at Sheldon, wrote to me

The pictures "speak for themselves," though not in the same sense as those you see at the local picture-palace, and call for very little explanation, the details being clearly shown. The valve-gear is a combination of those I specified for the inside and outside-cylinder *Maid of Kent*, which is different from the direct Stephenson link motion of the full-sized compounds. It gives an excellent steam distribution,



Literally a "Webb" compound !

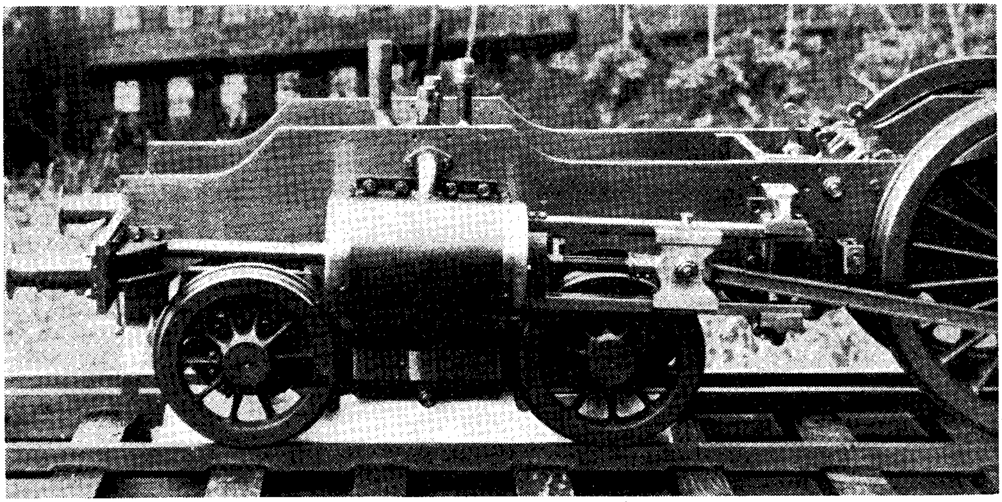
for some information about an outside-cylinder 5-in. gauge 4-4-0 he wanted to build. The proposed engine was to be a replica of the well-known *Crimson Ramblers*, as far as externals were concerned, and our friend proposed using the cylinders and motion of the *Maid of Kent* on it. It will be remembered that I gave an outside-cylinder variation of the original design, to please those who preferred outside cylinders. I replied to the queries, but couldn't resist a friendly "crack"; so I added that as my correspondent's name was Webb, and that name was forever associated with compound engines, and the *Crimson Ramblers* were compound engines, why not go the whole hog, and make the little engine literally a "Webb" compound? It wouldn't entail much extra work to instal the third cylinder, and should prove an extremely interesting job.

That did it! Francis Webb, of Crewe, was a man of fixed ideas; and clever though he was, wouldn't take a tip from anybody. Arthur Webb, of "Baernegum," was "just the other way about," as my old granny would have remarked; he was not only immensely tickled with the idea, but promptly put it into practice, with the result that can be seen in the photographs of the job, as far as it has progressed at time of writing. The photographs, by the way, are the handiwork of Mr. J. B. Lea. The wheels, and the outside motion brackets, were supplied by our Scottish friend "Wilwau"; all the other castings were made locally, from friend Webb's own patterns. They are in "Admiralty specification" gunmetal, no traces of blowholes or other faults, and were very reasonable in price.

and will notch up very well, though jacked up and running on air pressure. The upper ends of the suspension levers, to which the valve-rods are connected, have been extended to provide a drive for two mechanical lubricators, one on each running-board. Although this is "all wrong" in theory, as the movement of the ratchet-levers on the lubricator will vary with the valve travel, according to the position of the reversing gear, in practice it matters little. I've done the same thing on my own engines, and had no trouble, by arranging the drive, so that the ratchet gear will always click one tooth when the gear is set at minimum travel. Sometimes this means that the ratchet clicks two teeth when the lever is in full gear; but as we never run in full gear, and only use it for starting, there is nothing for Inspector Meticulous to worry about. It is even an advantage to be able to pop in an extra shot of oil sometimes, by shutting the regulator and dropping into full gear. If old 431 of the L.B.S.C.R. could have operated thus, there wouldn't have been any occasion for young fireman Curly to go catwalking along the running-board (gangway, we used to call it) with a "kettle of dope!"

One thing that the full-sized engines never had is incorporated in friend Webb's version, viz. a crosshead pump, operated from the inside cylinder. The bypass and delivery unions of this can be seen sticking up in front of the inside cylinder cover. None of the cylinders has a tail rod to the piston; the extensions on the outside cylinders are just dummies, though they serve a useful purpose, to wit, they keep the polished outer covers in place.

Mr. Webb says that even on air pressure, the performance and power has far exceeded his expectations. She will turn over very slowly in full gear, the movement being perfectly even; and he had a convincing but very painful demonstration of the power, when he was wiping the motion with an oily rag whilst it was moving. His finger got caught between the connecting-rod and guide-bar; and though the movement was very slow, it didn't stop—simply split the end of his finger, splashing blood over the moving parts, and carried on imperturbably. Our worthy friend says he will make certain there is no more of that lark!



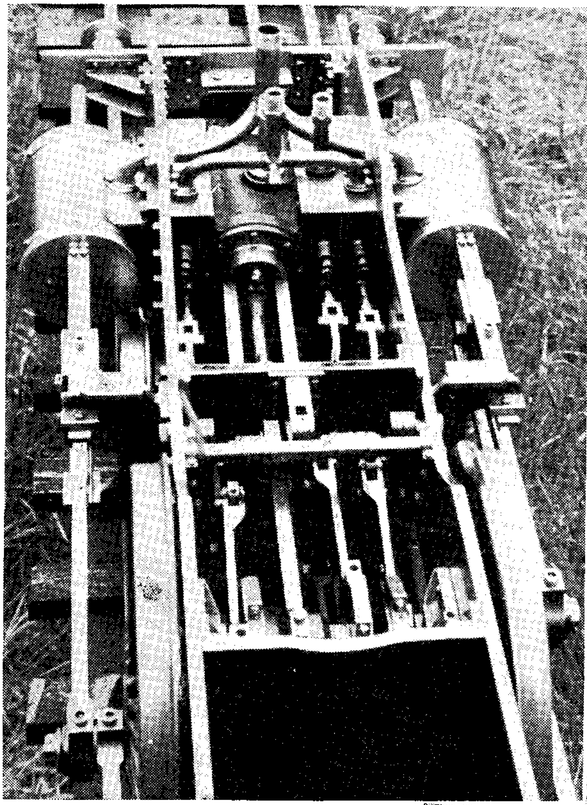
One of the L.P. cylinders

With air pressure applied to the inside cylinder, and the exhaust connected to the outside steam pipes, the engine works "compound" quite smoothly, but quite silently. With the air supply connected to the outside (low pressure) steam pipe, and both steam and exhaust pipes of the inside (high pressure) cylinder, so that the piston of same just floats, she behaves just like an ordinary two-cylinder "simple." This is just as it should be; but many won't perform satisfactorily on air, even if they will with steam, so our friend has something to be satisfied with. There is still some work to be done to the chassis; meanwhile he is collecting boiler material—some job in this crazy world of today!—and proposes to use a boiler like I specified for *Minx*, but with a divided superheater, to reheat the exhaust steam, same as I did on *Jeanie Deans*. Instead of the double-port regulator of the full-sized engines, Mr. Webb proposes to fit an ordinary large-bore valve between the two sections of the superheater, which will "short-circuit" the inside cylinder when starting. This still leaves the engine under the full control of the main regulator, and is a variation of the intercepting valve on my own compound engine, though I don't use mine unless she is starting from "all cold." Our friend concludes his letter with good wishes, which I heartily reciprocate, with congratulations on his latest effort; and he says that the *Lassie* is going better than ever. May she long continue!

Weeny-weenies

Judging from some recent correspondence, some owners of small gauge clockwork and Milly-Amp-operated outfits are getting rather discontented with their "mechanical mice," and are developing a yearning for a real steam locomotive, to run on their flea-gauge lines. They are asking me if I can do anything about it! Well, to be quite frank and honest, I have very little interest even in gauge "O," let alone anything smaller. Mind you, I'm not bigoted, and fully realise that the worthy brothers who have raised the question, and maybe thousands of others besides, get just as much kick out of operating a little train around a line which can be accommodated on the kitchen table, as I do when driving a powerful little "real" steam locomotive around my own road, with two or three living passengers; or even handling a full-sized engine. It is just a matter of personal taste, as the man in the coffee-shop said when he put a grilled kipper in a basin of mutton broth, and thoroughly enjoyed the result.

New readers may be interested to learn that, some 25 years ago, I designed, built, and demonstrated in public, the first coal-fired gauge "O" steam locomotive that ever hauled a living adult passenger, when everybody derided the idea, and said it was impossible. The engine was *Sir Morris de Cowley*, a 4-6-2 development of the Southern *King Arthur* class, hence the name. I still have her, and she still runs. Since then, I have described in these notes, several other gauge "O" steam locomotives; the *Bat*, a Southern Schools class 4-4-0, the *Owl*, a L.M.S. class "4F" 0-6-0, and one or two nondescripts, such as *Mollyette*, a L.M.S. class "3" tank

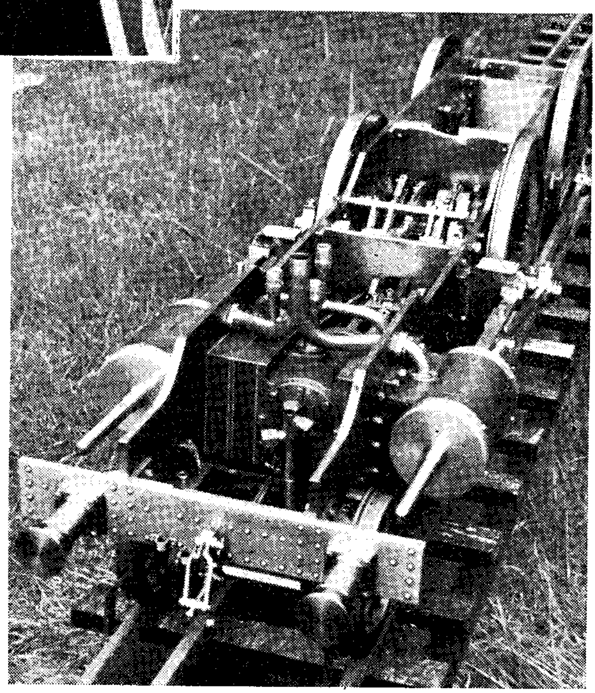


The "works"

engine of 0-6-0 type, simplified to the status of a kiddy's toy, albeit it would pull a tidy train of wagons for 20 mins. or so, non-stop, on one filling of the boiler. Erstwhile clockwork and electric "O"-gaugers might find the satisfaction of their yen for a steam locomotive in the above, as blueprints are obtainable from our offices, and they can adapt my instructions to the job of building the little engine.

Steam locomotives smaller than "O" gauge, *can* be built, and will run, but they are decidedly not a practical proposition. The trouble is the old one, that Nature just refuses to be scaled. In the early days of these notes, Mr. George Sell, at that time on the staff of Bassett-Lowke's, showed me a little 0-4-0 engine in "OO" gauge, $\frac{5}{8}$ in. between rails. She had outside cylinders, with the valves operated by a simple return crank; no reversing gear. The "works" were quite O.K., the trouble was getting steam to run them. She had a "pot" boiler, spirit-fired with, wicks underneath. Now, if those wicks were a certain distance below the boiler barrel, the flames burnt all right, and there was plenty of steam; but the unfortunate part was, that to obtain this result, the boiler needed setting in a position far above "scale" height. If placed at the correct height, it almost touched the wicks, and could absorb very little heat from the flames.

Mr. Sell challenged me in a friendly way, to make a coal-fired boiler suitable for this engine. I took him at his word, and made two of them. They were of the wide-firebox Atlantic type, with grates $\frac{3}{4}$ in. square, the firebars being made from domestic blanket pins. The fireboxes had $\frac{1}{8}$ in. water spaces, and the barrel contained two $\frac{1}{4}$ in. tubes; it was $\frac{5}{8}$ in. diameter, equal to 4 ft. 8 in. in full size. The chimney was $\frac{3}{16}$ in. diameter. I took one of the pocket kettles to the Caxton Hall, and steamed it. We got 40 lb. of steam in 90 sec. from all cold. Old George Kennion operated the tyre pump with such vigour, that there was a shower of "golden rain" from the chimney! This was, of course, far superior to the spirit-fired pot boiler arrangement, but was useless for practical purposes, as the boiler only held enough water for a couple of minutes' run, and it was next to impossible to fit a feed pump to the engine. Also, it was obviously impossible to fire the weeny box when the engine was



Note "plumbing" and pump connections

running. I gave the second boiler to a friend who suggested silverplating it, and hanging it on his watch chain!

I have an idea for a design for an "OO" gauge spirit-fired locomotive that would make quite a long nonstop run with a ten-coach train, or a load of "wagonettes"; but as mentioned above, I've no interest in this size, they are only glorified toys, and it takes all I've got, to carry on with 3½-in. gauge designs. However, if any of the flea-gauge fraternity care to have a go, they could adapt my larger engines by reducing the sizes of the parts to suit themselves. The height-above-the-flames business could be got over by using the shell of the locomotive-type boiler, with a horizontal partition in it, the back end of the upper part being closed by the back-head, and the front end of the upper part being closed by a semicircular piece of metal silver-soldered in, just behind the chimney. This would form the water compartment; the lower part of the barrel would form the flue. A couple of small spirit burners at the bottom of the firebox casing, would provide heat in plenty; the flames would impinge on the underside of the horizontal partition, all of which would be heating surface. A regular, though Lilliputian blastpipe under the chimney, would pull sufficient air through the firebox casing and the semicircular flue, to ensure good combustion and plenty of heat.

Gauge "O" Valve Gears

Before leaving the microscope department, just a word about small valve gears, as I have had plenty of queries about these also. Wherever it can be used, I recommend loose eccentric gear, without hesitation, for engines of "O" gauge, or smaller, that are used for hauling trains of coaches and wagons over "scenic" railways. With valves between the frames, as on a gauge "O" *Maisie* or *Iris*, there is one solitary pin joint between the eccentric and the valve spindle, so that pin wear is negligible; consequently, the valve setting remains true. If the cut-off is set at 60 per cent., or even 55 per cent. (it should not be below that, or the engine will have a "dead point," and may sometimes refuse to start unaided); steam consumption is very small, yet the engine will have plenty of power and speed. A small Great Western 4-6-0 tender engine, with valves on top of the cylinders, will have three pin joints per cylinder, viz.: one at each end of the pendulum shaft, or rocking shaft, and one at the valve spindle. I recommend one inside cylinder only, for all inside-cylinder types, with the valve at the side, and one eccentric. With this arrangement, the engine will run at a tidy lick, and pull a decent load—so what more is needed? Scores of single-cylinder *Mollyettes* have been built; some of them have been illustrated in these notes, and they all do the job.

In the case of gauge "O" engines whose full-sized relations have outside valve-gears, it is possible to simplify matters, and obtain a fairly robust gear, without sacrificing appearance. The wheeze is, to make the gear what I call "single-sided." This method will also answer all right on bigger jobs; for example, the 2½-in. gauge *Dyak*, and 3½-in. gauge *Princess Marina*, both had single-sided gears, and there are plenty of both types running around, goodness only knows! The Walschaerts expansion link has a trunnion pin on the outside only, running in a long bearing bush in the link bracket. The end of the pin is shouldered down, and furnished with a nut and washer, so that the link can't come adrift. The straight radius rod passes on the inside, or open side, of the expansion link; and in the case of a gauge "O" engine, a single silver-steel pin, fitted into this, engages with the slot in the link, and acts as a die block. The end of the radius rod is slotted, and bears against a lifting arm on the reversing shaft, which prevents it from coming away from the link. A pin in the lifting arm engages in the slot in the radius rod, lifting or lowering it as desired; and that is all there is to it. The eccentric rod is straight; no fork is needed, as the tail of the link has a pin, same as the return crank. "Crankpin" joints are also used in the lap-and-lead movement.

Baker

Where Baker valve gear is desired, only the outer side of the girder or bracket-type frame is needed. The reverse yoke is a single bar, pivoted at the bottom, by a crankpin joint, to the gear frame plate. The radius bar is also single, hung from the reverse yoke on a crankpin joint. The gear connecting-rod is also flat, hung by its middle, to the bottom of the radius bar. The bell crank is cut from a bit of flat plate, and hung from the gear frame by a crank-pin joint, a spacer being placed between the bell crank and the gear frame plate, to bring the bell crank level with the inside of the gear connecting-rod, to which it is attached at the top. In fact, the whole box of tricks is made in exactly the same way as the demonstration gadget described in the *Live Steam Book*, only the workmanship should be a little more posh! When erected with the single gear frame plate on the outer side, you have to look closely, to discern the difference between the single-side outfit, and the regulation type of gear, such as I described for *Juliet No. 2*. I can personally testify to the fact that it works all right, for when living at my old home at Norbury, I built an American Atlantic, in gauge "O," for a friend in U.S.A. She was a spirit-fired job, similar in appearance to the Pennsylvania E6 type, except that she had single-sided Baker valve gear, as above described. I called her *Minnehaha*; I don't reckon to know much about Red Indian folk-lore, but I believe that was the first name of Hiawatha's little bit of fancy goods. However, although the little engine only had a water-tube boiler, fired with a "poison-gas plant," she could hit the high spots with a dozen coaches, and keep on doing it, all the time there was water in the boiler and spirit in the reservoir. A picture of her, with a short description, appeared in the early days of these notes.

Anyway, she crossed the big-pond—not under her own steam, I hasten to add!—and went into service. When I followed suit some years later, there she was, still going strong. While over

(*Continued on page 728*)

A SMALL HOME-MADE LATHE

by R.H.F.

BEFORE describing this home-made lathe, I must explain that my aim in building it was to provide a simple machine for occasional light hand-turning and drilling, etc. at a minimum cost. It was a spare-time job for a friend and everything except the mandrel, headstock bearing and sundry bushes had to be made by hand, as my workshop is very limited. Although rather an experiment, the result is well up to requirements and the design could easily be adapted to a larger model by anyone wishing to make a modest start in machine tools.

I have endeavoured to arrange the drawings to show particular items in the text, but they are not necessarily complete in every detail; for instance, the wood base is omitted from the plan view, Fig. 1. First item is the mandrel, "A" Fig. 2. This was originally intended for something else and is hardened and ground on the outside, the various adaptors for centres and chucks being a good push fit on the nose and locked by a set-screw. Under the circumstances, this arrangement proved very convenient and quite adequate for this size of machine.

The headstock consists of two end-plates 3/64 in. × $1\frac{1}{2}$ in. flat steel, an inverted U-piece, 3/64 in. steel, a base plate $\frac{1}{16}$ in. thick and a gunmetal bush, "B," all bolted together with 4-B.A. screws and nuts. The centre-piece, being made slightly short, clamps down on the bush, which is drilled and tapped for a wick-feed oiler. A brass washer drilled to retain six $\frac{1}{16}$-in. steel balls takes the mandrel thrust against a hardened steel plate "D" Figs. 1 and 2, supported and adjustable by the two 6-B.A. capstan-headed screws "E," seen in plan.

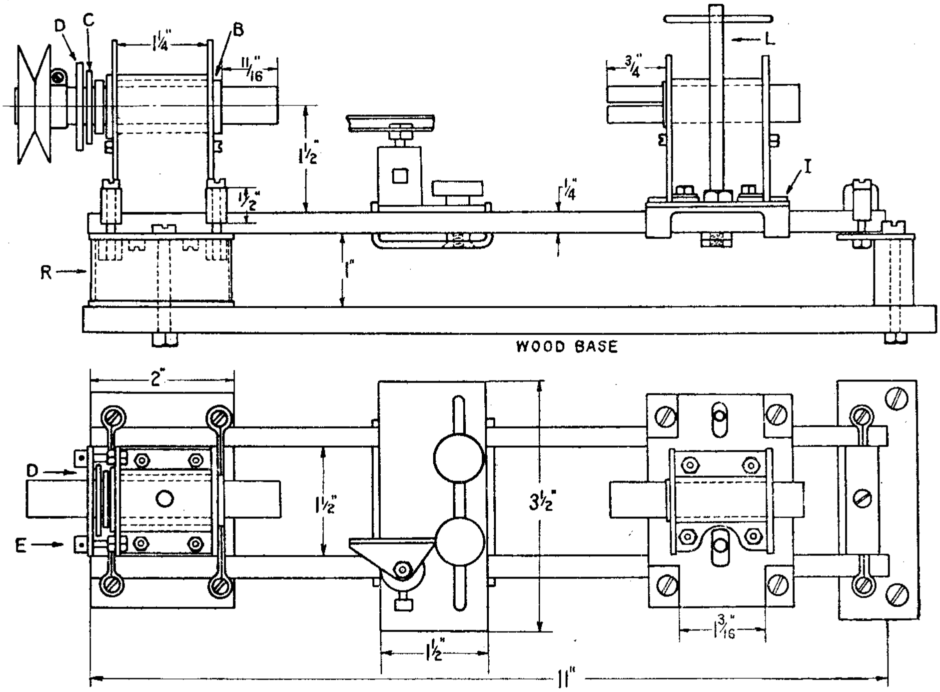


Fig. 1

Two round silver-steel bars form the bed, clamped as indicated in end view "F" Fig. 2, which has one endplate removed. Four 4-B.A. screws pass through clamps and baseplate and screw into two $\frac{1}{4}$-in. square section strengthening bars underneath baseplate. The clamps are 3/64 in. flat steel folded round as shown at "H," Fig. 2. At this stage the mandrel and bars were checked and adjusted for alignment in both planes, the bottom and sides of headstock being filed as necessary until accuracy was obtained; the front bar is the most important, as it controls alignment of the tailstock. "G" shows a similar arrangement at tail end of bed. This completes this section, and it is now mounted on a wood base as shown in Fig. 1, with a steel box section and

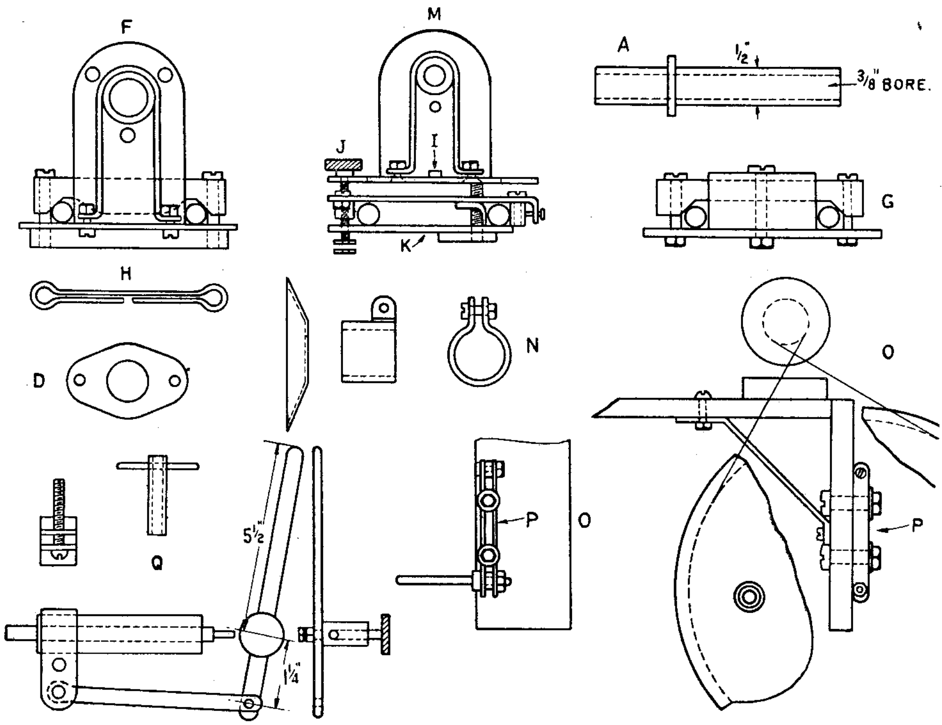
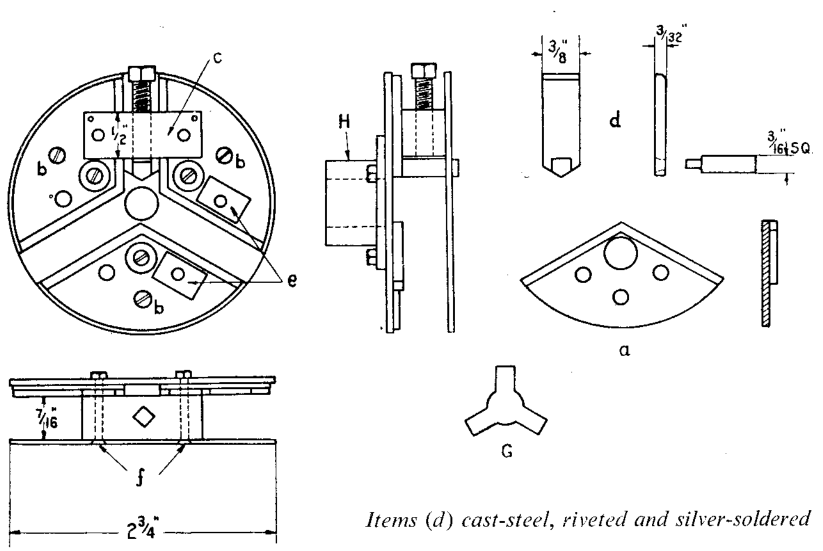


Fig. 2



Items (d) cast-steel, riveted and silver-soldered

Fig. 3

packing plate next the wood supporting the headstock end.

View "M" Fig. 2, is the tailstock built up similiar to the headstock, the barrel being a piece of stout brass tube bushed at both ends to $\frac{3}{16}$ in. bore. The end-plates are located on a key I, Figs. 1 and 2, which is pinned to the base plate after the barrel has been accurately aligned in both planes with the headstock. The baseplate has the corners cut away, as seen in plan, Fig. 1, T-headed nut closing on the split end of the barrel. Similar centres $\frac{1}{4}$ in. diameter are provided for the headstock, being supported at the pulley end by a removable bush and located and driven by a split-clamp adaptor on the mandrel nose.

The original intention was to rely on centres, a steady and a pin chuck fitted to the mandrel nose, but it soon became evident that something more was desirable, and still being determined

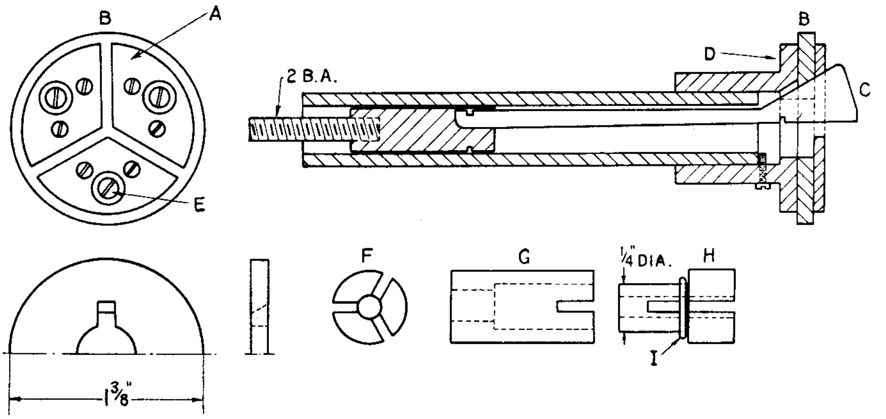


Fig. 4

to locate between four screw heads fixed in the separate sliding-plate, which is arranged as indicated at "M" to slide along the bed and locate in the front bar only. This arrangement permits transverse adjustment of the tailstock, which in turn is locked by the screw "J" screwing into a bush riveted to the underside of the slide-plate; two lock-nuts at the lower end of the screw loosely support one end of clamp "K." T-headed screw "L," Fig. 1, clamps the whole assembly to the bed; slots for these two clamp-screws are shown in plan view Fig. 1. "M," Fig. 2, shows the tailstock lifted from the slide, and should make all this clear.

The group of sketches "N," Fig. 2, shows parts for the small pulley. Two 3/64 in. steel washers, dished as indicated, are soldered to the clip which secures it to the mandrel; the effective diameter is about $\frac{3}{4}$ in. As there is no other power available at the moment, the drive is by a hand-wheel $10\frac{1}{2}$ in. diameter built up from a centre disc of wood and two 3-ply flanges; a $\frac{1}{8}$ in. round belt (crossed) completes the drive. Sketch "O," Fig. 2, indicates the general idea and adjustment "P" for belt tension. I find this ratio just about right for turning up to $\frac{1}{4}$ in. diameter steel, brass up to about $\frac{3}{4}$ in. and drilling brass up to about $\frac{3}{16}$ in., but it would be an advantage to have a lower gear for drilling steel over 5/32 in. A double pulley and thicker belt for the heavier jobs is indicated, and we may, in time, fix up a treadle drive.

The lever feed on the tailstock is shown at Group "Q," a $\frac{3}{16}$ in. silver-steel spindle carries a drill chuck and male and female centres are provided. These can be locked by the clip and to stick to home production, I decided on the 3-jaw independent chuck depicted in Fig. 3, capacity about 0.40 in. up to $\frac{1}{2}$ in. diameter. The backplate, frontplate and three segments "a" are 3/64 in. flat steel, segment "a" being built up with strips soldered to the edges, to 3/32 in. thick. These are fastened to the back plate by three 6-B.A. screws "b" passing through clearance holes. The built-up edges are filed as accurately as possible to 120 deg. and adjusted so that jaws "d" line up accurately in the centre. A land about 0.065 in. wide is left on the gripping face of the jaw. Three 2-B.A. silver-steel screws acting through the blocks "c," provide inward pressure for the jaws, which are opened by hand, but this is no hardship; packing-pieces are fitted under blocks "c" and adjusted for thickness until the jaws slide freely with no shake. The front elevation shows some of the parts in their various positions. After these parts are located, blocks "c" are drilled and dowelled to the backplate, clearance holes being made in segments so that future adjustment can be made if necessary. The backplate is drilled $\frac{3}{8}$ in. in centre and boss "H" fixed with three 4-B.A. screws and nuts, and for convenience in assembly, the frontplate was first drilled $\frac{3}{8}$ in. and slotted as at "G" to fit loosely over the jaws. The whole lot was then mounted on the mandrel with a $\frac{3}{8}$ in. bar passing right through, and the front plate drilled for the six 6-B.A. screws and nuts "f" and the centre hole finally opened up to $\frac{1}{2}$ in. dia.

I admit a fair amount of patience and care was necessary for this unit; however, the result was satisfactory, but parts should not be gripped

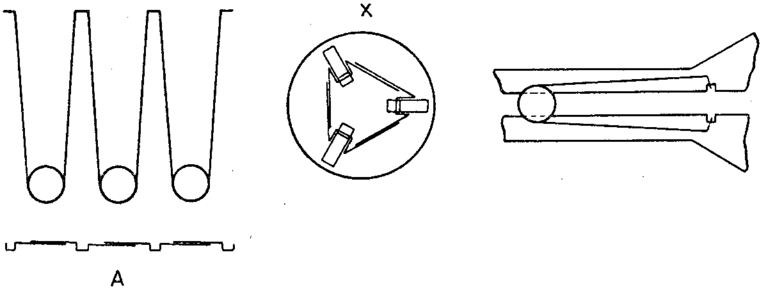


Fig. 5. *The two ends of* " *A* " *are soldered together after forming as at* " *X.*" (*Material* 0.024 *piano wire*)

too near the nose without due care, as considerable pressure can be obtained with the 2-B.A. screws owing to their rather fine threads.

One self criticism ; it would be better to substitute $\frac{1}{8}$ in. steel for the 3/32 in. part of the jaws.

The next necessity was some means of holding small parts 3/32 in. diameter to about 0.015 in. diameter, and after several ideas were scrapped, I finally succeeded with the three-jaw self centring device, Fig. 4. I abandoned this idea once, owing to the difficulty of cutting three radial slots accurately enough by hand, but I finally hit on the method shown. Frontplate " B " has three slots about 3/32 in. wide and at 30 deg. on the outer ends to match the angle of jaw. These slots control inward movement of jaws " C," Segments " A " have six 8-B.A. screws passing through clearance holes into tapped holes in the frontplate, and are adjusted so that the jaws meet accurately in the centre and move freely without shake (this is done when assembled to mandrel). The jaws of 1/32 in. cast-steel were roughed out to shape, hardened and tempered and finally filed as near identical as possible, the gripping edges being filed at an included angle of 120 deg. to leave a land a little less than 0.020 in. wide. They will then grip on about 0.012 in. diameter. Care should be taken to see their edges all lie parallel along a test-piece about $\frac{1}{16}$ in. diameter ; they will then grip right on the nose when closed.

The front plate is attached to clutch body " D " with three 6-B.A. screws " E " passing through enlarged holes in " B " and with good clearance for the heads in the segments. Clearance slots are also required for the jaws in the face of the clutch body. Opening of the jaws is by the spring arrangement Fig. 5, closing is by handwheel and washer (in my case an old wireless control knob) on the 2-B.A. thread, acting through the draw bar, detail at " F, G, H." " G " and " H " are pinned and soldered together after ring " I " (piano wire) is in place, and this part of the jaws should be left as wide as possible so that they meet in the centre. Two are assembled first and No. 3 hooked in and folded down in place.

Now the real advantage of all this is that concentricity of the chuck can be adjusted and corrected at any time by slightly loosening screws " E " and setting the front plate in relation to the clutch body, until a test-piece gripped in the jaws runs true. This adjustment is quite independent of the segments, which need not be altered except for wear. Although I made this unit after the lathe was taken away, the chuck was trued up when fitted to the lathe in about five minutes.

" L.B.S.C."

(*Continued from page* 724)

there, I ran the rule over her, to see how she was—or rather wasn't—wearing. There was nothing amiss ; and when I left, she was still doing the doings, as merrily as ever. Later on, I sent her a " stable companion " in the form of *Josie*, a 4-6-2 of similar appearance, but with a single-sided Walschaerts gear as described above. The last I heard of them they were still in service ; but soon after, my old friend passed to the land beyond Jordan, so what became of the engines, I don't know. I only hope they found a good home.

As regards the dimensions of gauge " O " valve gears, the distances between pin centres, that I specify for bigger engines, can be reduced in proportion to size. Thus a half-size edition of any $2\frac{1}{2}$-in. gauge gear would work all right ; or a one-third version of the gear described for a $3\frac{1}{2}$-in. gauge job, would be ditto. The rods and links would have to be proportionately thicker in section, and the pins bigger, or the wee gear would be too flimsy ; as I often say, Nature won't be " scaled." Well, that will be all for now, as I've some more *Britannia* drawings to make ; couldn't do them this week, as I've been to see the Chief Molar Engineer, and my mouth, at time of writing, feels as though he used a five-ton hydraulic jack !

*A Portable Tape Recorder

With Notes on Magnetic Recording

by Raymond F. Stock

THE amplifier is of normal construction and Fig. 16 shows the layout of chassis and main components. The support pillars for the aluminium chassis are bolted to the floor of the carrying case, while the absence of sides to the chassis permits circulation of cooling air. The input transformer is not mounted directly upon the chassis; when the recorder was completed the transformer in its can was experimentally orientated in various planes to reduce hum pick-up to a minimum, and was finally fixed in the best position by brackets. This accounts for the rather awkward-looking mounting arrangements seen in the photograph.

Screened *flexed* conductors are shown for the low impedance circuits, and this is important in avoiding hum.

The placing of **S3** at the front of the chassis and beneath it was found essential, as when combined with **S1** and **S2** in a normal ganged switch it was too close to the field of the power pack.

The avoidance of hum is, in fact, one of the major problems in designing

*Continued from page 699, "M.E.," May 29, 1952.

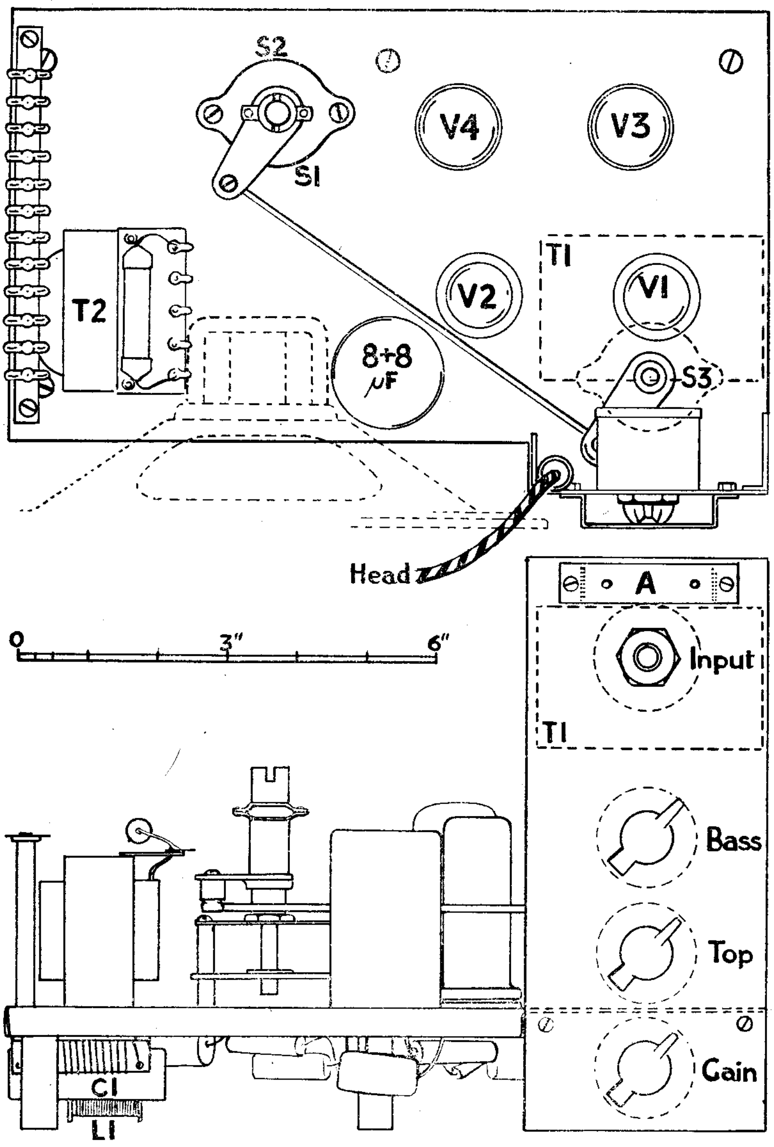


Fig. 16. Amplifier chassis. Bracket "A" is bolted to the front of the case and the pillars to the base

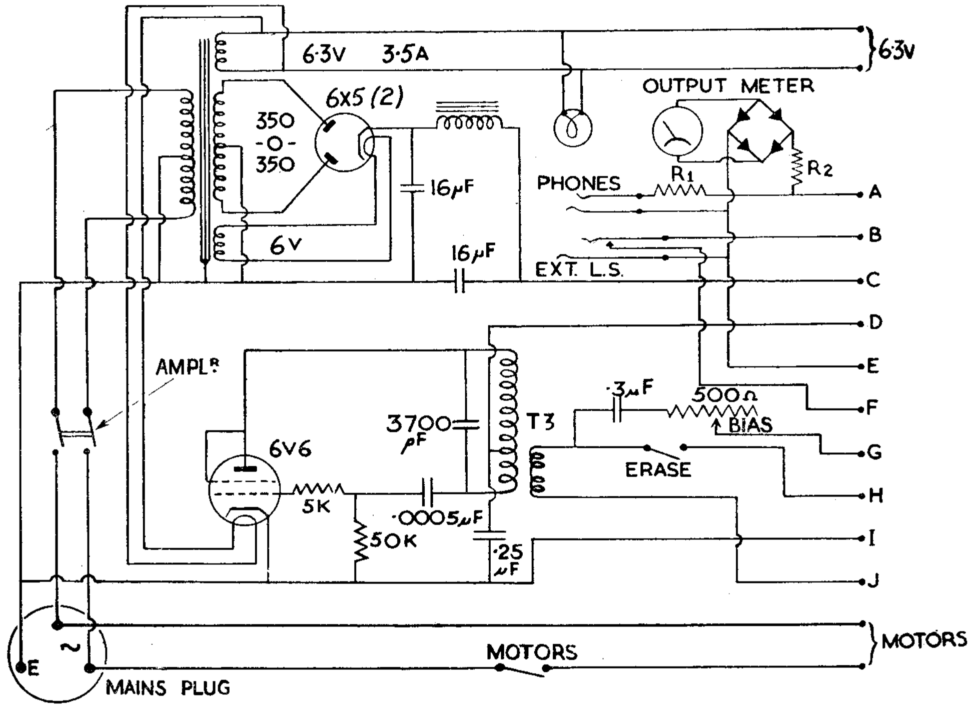
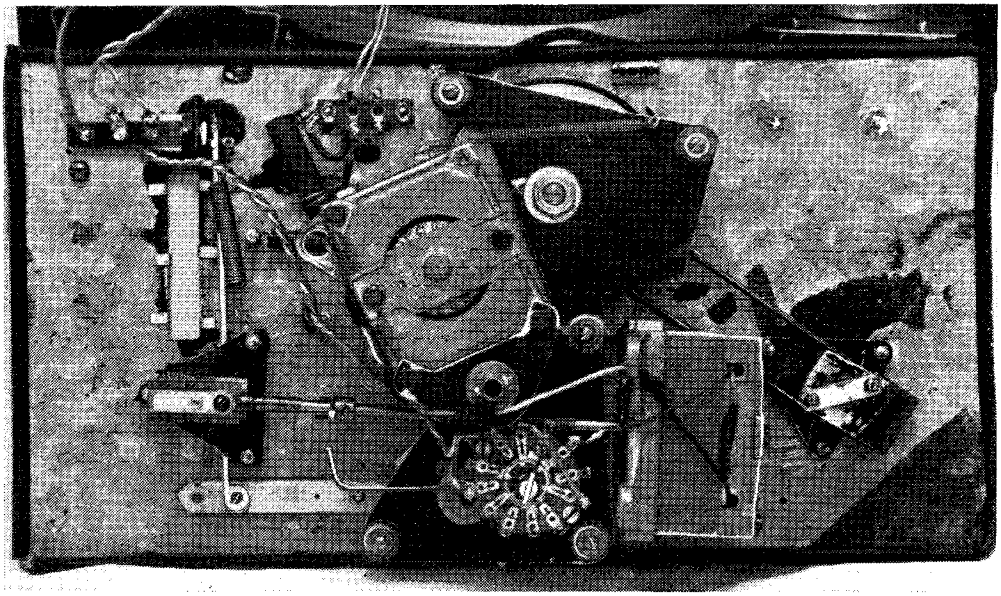


Fig. 17. Circuit of power unit, oscillator and output arrangements T3 is discussed in the text



Underside of deck. The take-up assembly shows minor changes from the drawings

compact mains-driven apparatus of this nature.

The Power Supply and Oscillator

Fig. 17 gives the complete circuit. The

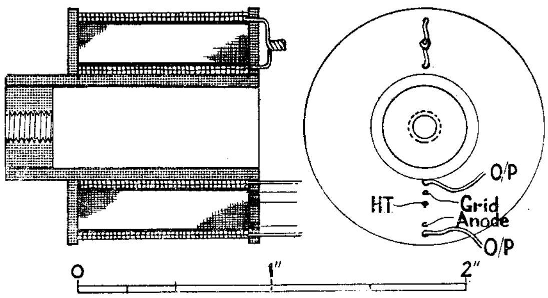


Fig. 18. *Former for T3*

power supply is conventional in design except for the use of two 6X5 rectifiers in parallel. This was adopted simply because there was insufficient room for a larger valve.

The oscillator is very simple and can hardly fail to work if the coil is correctly made. The former for the coil (**T**3) is illustrated in Fig. 18 and is made from paxolin tube and sheet. The secondary is in two halves each having 90 turns of 26-g. enamelled wire with a primary of 1,200 turns of 36-g. sandwiched between them. The separate windings are insulated by a turn of waxed paper between and the primary is tapped at 400 turns. The tuning condensers of 3,700 pico Farads are ceramic.

The 500-ohm bias resistor is wire wound. **R**1 was adjusted until a comfortable sound level was registered in the phones when accepting an average recording signal.

All the inter-chassis connections shown on the right are taken to a 12-way connecting strip and 1 in. lengths of wire were used to link up with the corresponding tagboard on the amplifier. Fig. 19 shows the physical layout of the parts, including (**A**) Level meter, (**B**) Bias control, (**C**) Amplifier switch, (**D**) Motors switch, (**E**) Erase switch, (**F**) Monitoring phone jack, (**G**) Extension speaker jack, (**H**) 6X5, (**I**) 6V6, (**J**) Pilot lamp (directly below scale on deck), (**K**) Choke, (**L**) Mains transformer, (**M**) Smoothing condenser, (**N**) Oscillator coil, (**O**) Mains input and (**P**) is " C " in Fig. 14, (**Q**) being the meter rectifier.

The complete unit is built within aluminium panels and these are tapped at various points to enable the assembly to be bolted to the carrying case. The components are all tightly packed within a width of 3½ in., since, though they are not mutually dangerous, they are all best kept as far as possible from the input side of the amplifier.

The speaker is not included with either radio unit but is bolted to the front of the carrying case, and connected to the appropriate tags on the amplifier connection strip. The meter is 0 to 1 mA. moving coil type.

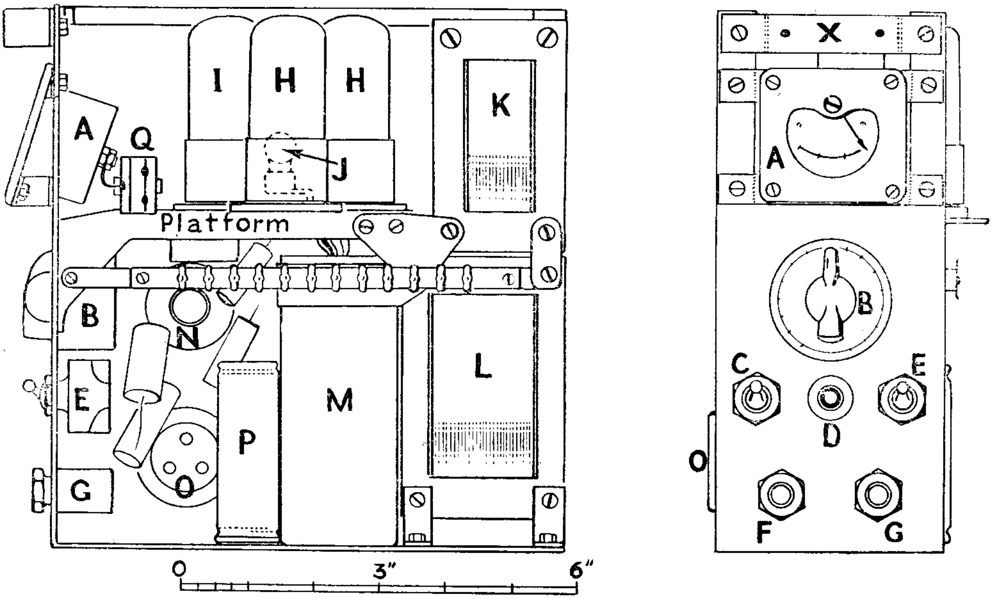


Fig. 19. *Layout of the power pack, oscillator and output circuits. Bracket " X " is bolted to the front of the case*

(To be continued)

Hand-Scraping Flat Surfaces

by Lawrence H. Sparey

THE credit for making the first artificial, truly flat or " plane " surface belongs to that famous British engineer, Joseph Whitworth, who, by a triumph of mechanical reasoning, succeeded in obtaining a flat cast-iron plate which was true to within one ten-thousandth of an inch. In the early part of the last century the problem had become acute, owing to the growing demand for machine tools of all kinds to meet new standards of engineering accuracy. Whereas, today, a plane surface may be otained by scraping to a *master plate,* the problem was entirely different when no master plate existed.

Whitworth's method was a most ingenious one, and consisted in scraping three plates one to the other in regular sequence, until all three showed perfect contact at all points. Two plates could not, of course, have given a true result, because it would be possible to obtain perfect mating if one plate were concave and the other convex. In this case, neither would have matched with the third, and perfect mating of all three was only possible when all were truly flat.

With modern machinery, such as the surface grinder, it is possible to produce flat surfaces to a minute degree of accuracy, yet the hand-scraped surface still holds advantages not found in the machine product. Most of the sliding surfaces upon which the accuracy of modern machines depend are, indeed, hand-scraped—in spite of the fact that a hand-finished surface is not a truly flat one in the strictest sense of the term. A scraped surface has only an *average* flatness, as it must of necessity consist of a closely-spaced series of high and low spots. To this fact, the hand-finished surface owes its superiority, as the " valleys " hold lubricant, and will, therefore, remain true for a long length of time. As the average depth of a scraper cut is in the region of 0.0001 in. the resultant surface may be considered perfectly flat for all practical purposes.

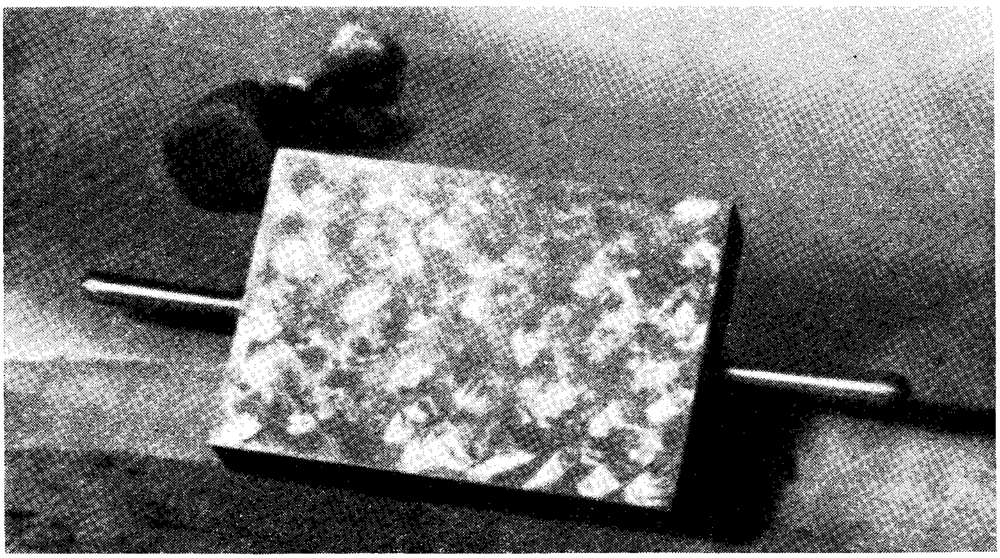


Fig. 1. Small surface plate scraped to a flat finish. In the background may be seen the cloth pad for applying the marking blue

Unless one wishes to follow the somewhat tedious method of Joseph Whitworth, which is hardly a proposition for the inexperienced, a master surface-plate against which results may be checked is a first necessity. Such plates are easily obtainable, but are rather expensive in the useful sizes. The model engineer may obtain good results by using a piece of ground plate glass, of $\frac{3}{8}$ in. or $\frac{1}{2}$ in. thickness, but the accuracy will not be so great as that obtained from a good hand-scraped surface-plate.

In addition, we require a set of engineers' feeler-gauges, a new second-cut file, a flat scraper, and a tube of engineers' marking blue. All these items may be purchased from any good tool shop, although it is quite possible to make the scraper from an old flat file. To do this, the end of the file should be made red hot, and hammered out until it spreads to a width slightly greater than the average width of the file, after which the end should be reheated and quenched

dead hard. One of the long, thin types of files is best, having a width of about $\frac{3}{4}$ in., a thickness of about $\frac{1}{8}$ in. or $\frac{3}{16}$ in., and a length of around 10 in.

Before grinding the end of the scraper to shape, it is as well to understand how it is used in practice. Scraping is always done with a *negative*

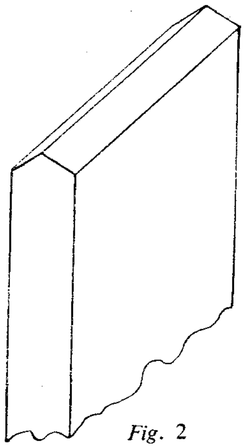


Fig. 2

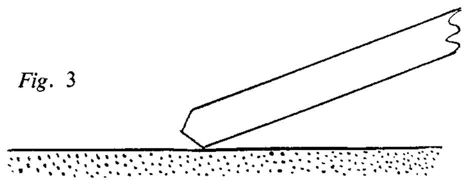
rake scraper. If the scraper is formed with a *positive* rake—like a wood chisel—it will dig into the metal, and the scraping job will be ruined. The drawing (Fig. 2) indicates the method of grinding the end of the scraper, while Fig. 3 indicates how the negative rake is used. Thus, in practice, the scraper is held at a fairly acute angle to the work, as may be seen in the photograph (Fig. 4) which shows a small surface-plate being scraped.

Stoning the Scraper

After the scraper has been ground to shape, it must be finished on a fine oilstone, using thin oil or paraffin as a lubricant. Stoning-up the cutting edges is probably the most important part of scraping technique, as the success of the work depends upon a correct sharpening of the edges, rather than upon any other single factor. In addition, a sharp scraper adds enormously to the ease of the work.

The photograph (Fig. 5) shows the correct method of holding the scraper to the oilstone, in order to preserve the correct negative rake.

Fig. 3



The tool should be pushed along the stone, away from the operator, and care must be taken not to impart a rocking movement, as this will round the cutting edges. A little practice will doubtless be necessary before perfection is attained. Some considerable pressure should be exerted during the operation. It is advisable also to stone-off the extreme edges of the scraper, so as to avoid any danger of a dig-in with this part of the tool.

The picture (Fig. 6) shows the final stoning operation, where it will be seen that the sides

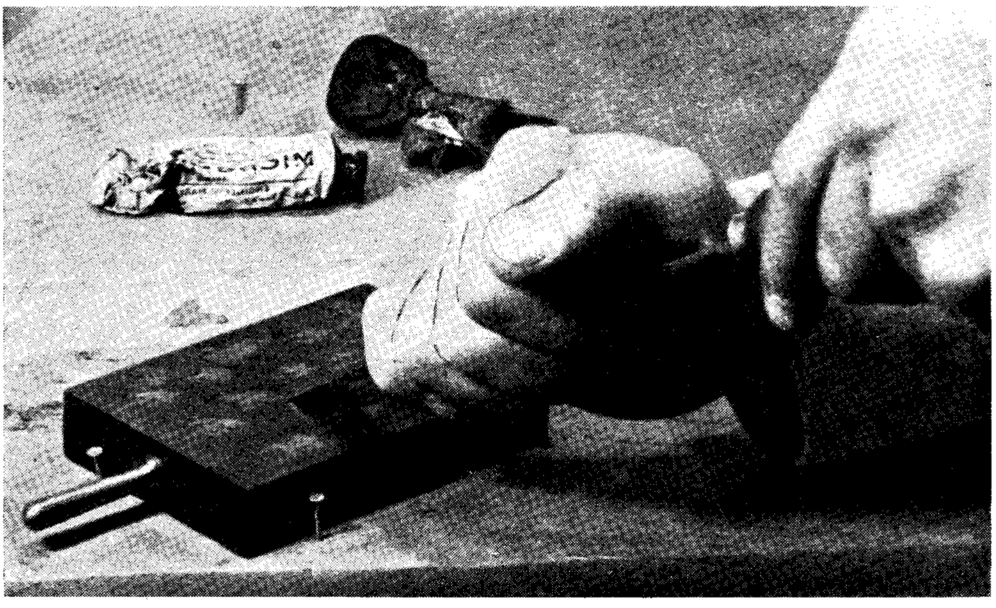


Fig. 4. First steps in scraping the surface plate. Note scraper held at acute angle to the work, so that it cuts on a negative rake

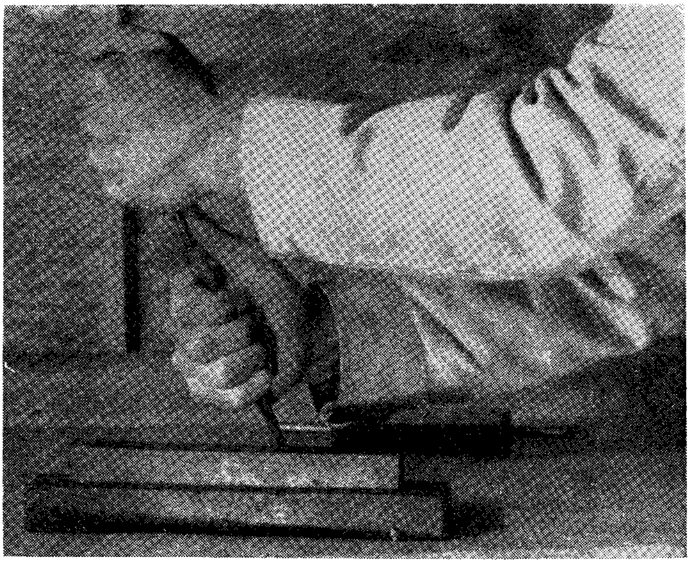


Fig. 5. Sharpening the scraper on an oilstone. Care is necessary not to round the edges by rocking

of the scraper are being flatted-off. Here, again, rock must be avoided.

Truing by Filing

On surfaces that are badly out of truth, it may be necessary to give a preliminary truing with the file, and it is first necessary to find out how much "out-of-flat" the surface is. To do this, lay the job face down on the surface-plate, and insert the feeler gauges around the edge, marking with chalk at the appropriate places the thickness of the gauge which enters. This will roughly determine the high and low spots, and give some idea of the amount of metal to be filed off. Continue filing, and checking on the plate, until the thinnest feeler (usually 1.5 thous.) will not enter anywhere around the edge. With careful filing it is surprising how near one can get to a flat surface, especially if the job is "blued-up" and checked on the surface-plate for high spots. Careful preliminary filing is well worth while, as it saves much tedious removal of metal with the scraper. Jobs such as lathe beds, where comparatively little wear has taken place, do not usually need to be filed, however, and it is as well to avoid the file on "important" jobs such as this. It is a little too drastic, and one careless cut may do irreparable damage.

Engineers' blue should be smeared lightly and evenly over the master surface-plate, using a piece of felt or a soft rag swab. Do not apply the blue too thickly, as this is liable to give a false reading.

Precautions

During the whole operation of scraping, absolute cleanliness is essential, as any grit between the job and the surface-plate will make correct reading of the blue marks impossible. In addition, it may well be that the surface-plate or the work-piece will be scratched. Therefore, cover the work-bench with a sheet of clean newspaper, and have at hand several clean pieces of rag with which to wipe the plate and work frequently.

Holding Work

On no account should work be held in a vice while scraping is in progress. Even quite large masses of metal mav be warped by the pressure of the jaws, so that the surface contour will alter when removed from the vice. Work should, therefore, be placed, unclamped, upon the work bench, but may be kept from moving by anchoring with a few nails driven into the bench around the job. Such nails may be seen in Fig. 4.

Bluing the Work

In order to distinguish the irregularities on the work face, the job should be placed firmly upon the blued surface-plate, and moved around in "a figure eight." This ensures that an even pressure is applied all over the work-piece.

Fig. 6. Stoning the scraper on the sides

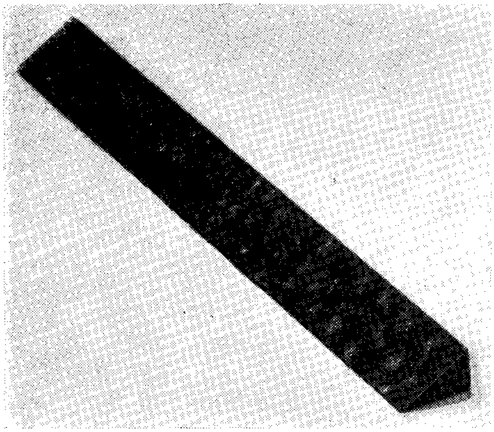


Fig. 7. Triangular surface-strip necessary for scraping " vee " slides

With large and heavy work—such as a lathe bed—the surface-plate itself must be placed upon the job, and moved in a similar manner. On removal, the high-spots on the work will be clearly marked in blue.

Scraping

The operation of flattening the surface consists only of removing the blued high-spots on the work with the scraper. When first blued-up, the work will most likely show large blue patches, and these must be scraped until no signs of the blue marking

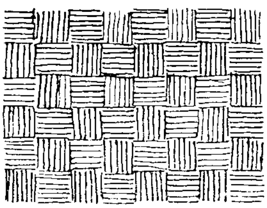


Fig. 8

remains. The work must then be wiped perfectly clean, the plate re-blued, and the high-spots again marked. When these operations have been repeated several times, it will be found that the spots of blue become smaller and smaller, and lie closer together, thus showing that more and more of the work surface is in contact with the plate. Work should continue until the blue patches number about eight or ten to 1 sq. in.

Finishing

When the work has reached this stage, the final flattening process may be attempted. This consists not in removing the whole of the blue spots with the scraper, but in *scraping off the bright high-spots which may be seen at the centres of the blue patches.* When this has been done, and the job re-blued, the surface will appear as a closely spaced series of blue patches and clear places. The closer these can be brought together—or, in other words, the more blue spots to the square inch—the flatter will be the surface. By repeated scraping of the *bright high-spots in the blue dots* a very close approximation to a truly plane surface may be obtained. Scrape alternately in different directions.

Breaking-up Surfaces

In addition to the actual flattening of irregular surfaces, hand-scraping is much used for easing tight mechanisms such as the slides of lathes and instruments. In this case, a surface-plate is not required, as the surface is assumed to be flat in the first place.

The object of scraping is to provide spaces in which oil may collect, and *remain* when the slide is moved. Very light scraping is necessary, and should be continued evenly over the whole surface. If done in this manner, the general truth of the surface is not affected, as the average depth of cut will be somewhere in the region of one-tenth of a thousandth of an inch. New ground surfaces very much benefit from this

(Continued on page 738)

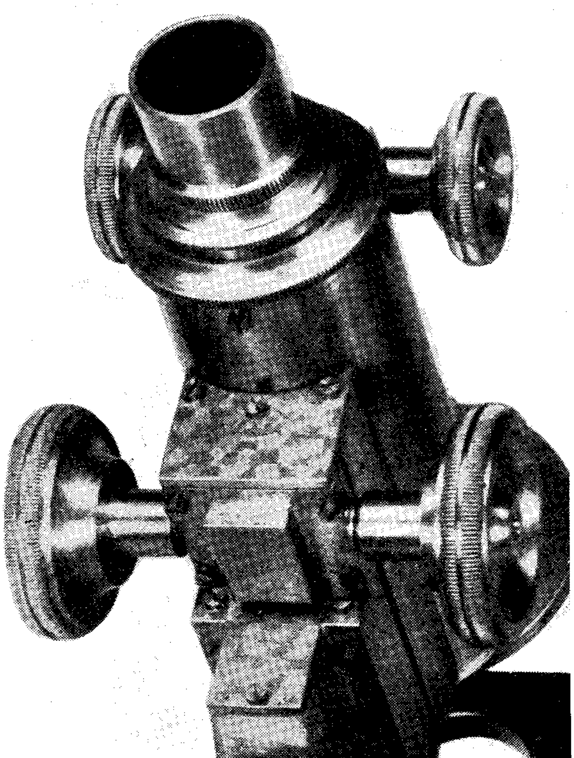


Fig. 9. Ornamental scraping. Checker pattern used on microscope components

SIMPLE GEOMETRY OF SHEET METAL WORK

by M. G. A. Ford

THE idea of saving time need not appeal to every model maker. If he be of the true faith, his work will never be done, no matter how quickly he pursues his immediate ends ; in any event, time and care go hand in hand.

There are some simple operations, however, which seem to persist in taking more than their fair share of trouble, and they are usually so simple that no attention whatsoever is paid to reducing them to their proper perspective.

Perhaps the chief among these annoying side-trackers of the earnest model maker, is the small shape, possibly only in cardboard, which must, nevertheless, fit its adjoining member properly and look solid. For example, a cone of a certain shape must be made. The part may be ever so insignificant, but the true modeller must have it just so. Let him do it quickly and " first time," however, instead of by the sometimes lengthy method of trial and error.

It may be that we already know this method (see Fig. 1). Why not ? It is certainly simple enough to work out for oneself. For those who have not used it before, however, it may release many spare minutes to spend on something of far greater importance.

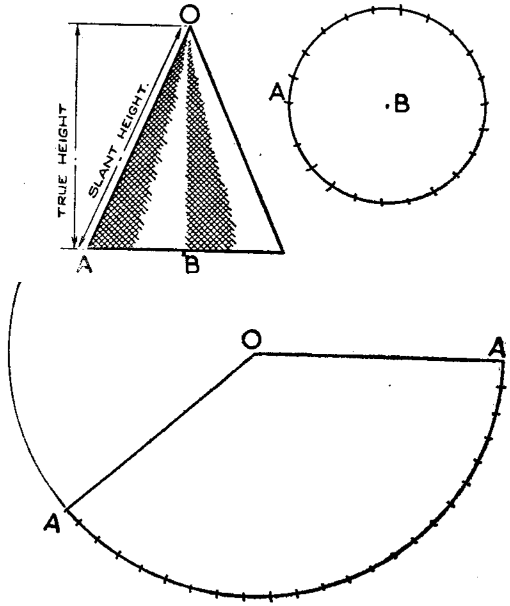


Fig. 1

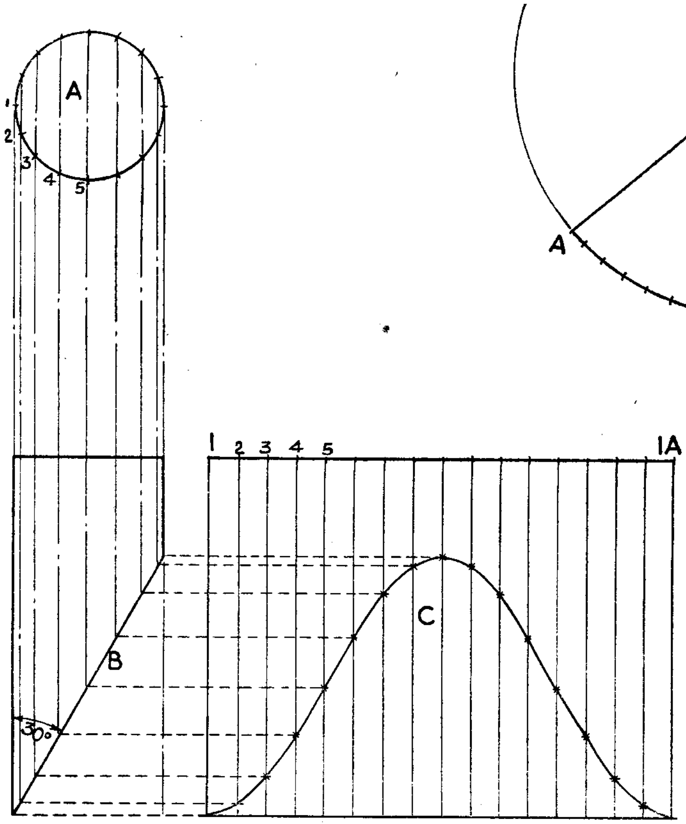


Fig. 2

So long as either the slant height or the perpendicular height is known, and the diameter of the base, nothing else is required. If not given, the slant height must be calculated from the true height by means of Pythagoras.

An arc, radius the slant height, and length the circumference of the base, joined to the centre by the radius of each end, will give the required shape. (If it is inconvenient to calculate the circumference of the base of the cone, it is a simple matter to draw it, and step off the distance by means of dividers.)

Probably the method of cutting a cylinder to fit an

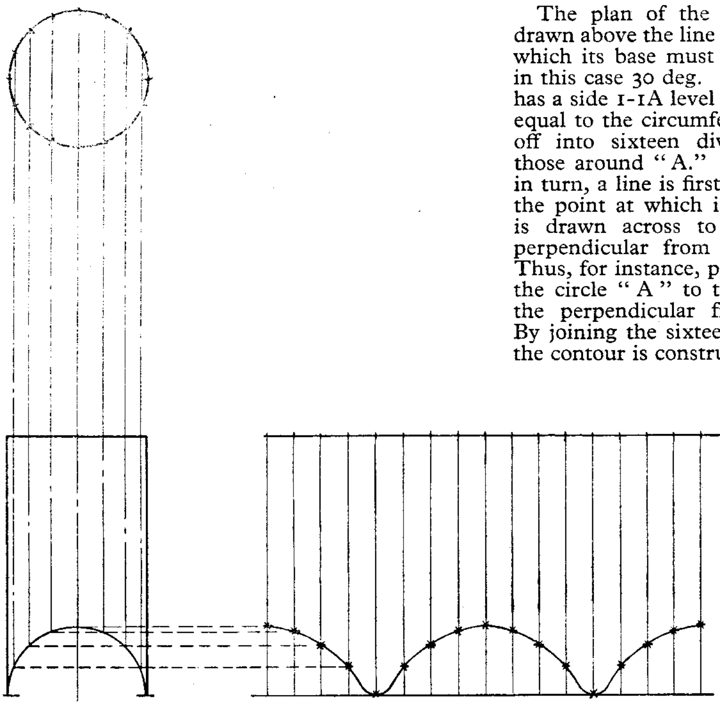


Fig. 3

inclined plane is less widely known. This certainly does save some nasty moments, as it can be seen from Fig. 2 that the result is not very easy to imagine in advance, and it is no simple matter to "slice off" a cylinder at an angle.

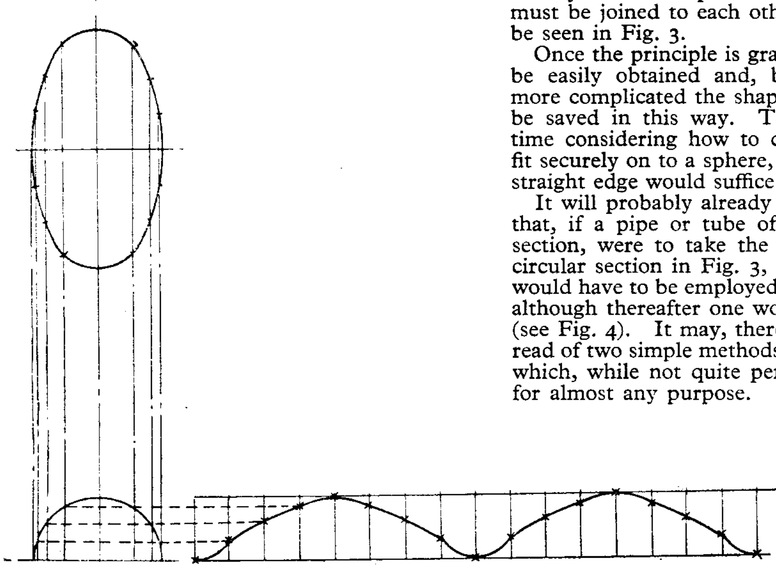


Fig. 4

The plan of the cylinder, a circle "A," is drawn above the line "B," representing the plane which its base must fit, and the correct angle—in this case 30 deg. The third projection, "C" has a side 1-1A level with the top of the cylinder, equal to the circumference of "A," and stepped off into sixteen divisions corresponding with those around "A." From each point on "A" in turn, a line is first dropped to "B" and from the point at which it strikes "B," a second line is drawn across to "C" until it meets the perpendicular from its corresponding number. Thus, for instance, point "5" is connected from the circle "A" to the line "B" and across to the perpendicular from point "5" in "C." By joining the sixteen fresh points thus formed, the contour is constructed to which the cylinder's base must be cut. (N.B.—A flange, to fix the two edges of the cylinder together, is here shown at each end of "C." These flanges, of course, have no bearing on the geometrical construction). The sort of curve which results from applying exactly the same practice where two cylinders must be joined to each other at right-angles can be seen in Fig. 3.

Once the principle is grasped, any contour can be easily obtained and, broadly speaking, the more complicated the shapes, the more time can be saved in this way. The author once spent time considering how to cut a cylinder base to fit securely on to a sphere, before realising that a straight edge would suffice.

It will probably already be clear to the reader that, if a pipe or tube of, say, elliptical cross-section, were to take the place of the pipes of circular section in Fig. 3, an ellipse and a circle would have to be employed instead of two circles, although thereafter one would proceed as before (see Fig. 4). It may, therefore, be of interest to read of two simple methods of drawing an ellipse, which, while not quite perfect, are near enough for almost any purpose.

An ellipse has two axes, the major, or long axis and the minor, or short axis. In Fig. 5, these are shown by "AB" and "CD" respectively. Take a straight strip of wood or metal, and at one end make a point "X." A second point, "Y" is placed at a distance from "X" equal to half the minor axis ; a third point, "Z" is located half the length of the major axis, from "X." If point "Y" is placed always on the line of the major axis, while point "Z" is kept always on the minor axis, point "X" will always lie on the ellipse. In this way any number of points "X" may be found and joined together, will make the ellipse. A slightly rougher, but still serviceable method, and a good deal easier one, is shown by Fig. 6.

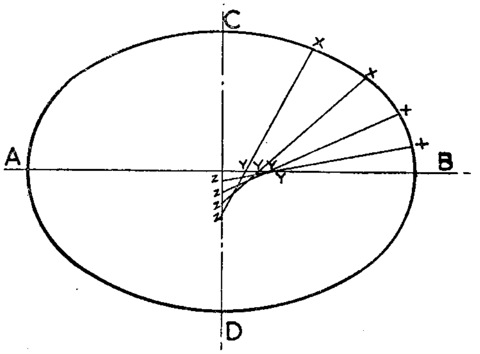
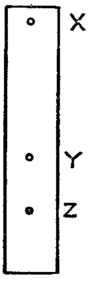


Fig. 5



The figure is almost self-explanatory. The sides and ends of the rectangle are divided into the same number of equal parts. These are joined as shown, and the result needs very little rounding off to be an ellipse.

In any case where accuracy is essential, the means I have described have solved many problems and dispersed many headaches. Very often, too, even where absolute accuracy is not required, a rough freehand sketch of this procedure will be found to give a good idea of the shape needed for the job, and provides one of the few ways of speeding up production with anything but a sacrifice to neatness.

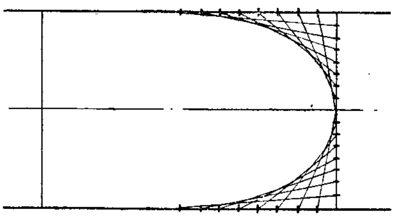


Fig. 6

Hand-Scraping Flat Surfaces

(*Continued from page* 735)

treatment, and will remain flat for long periods.

Ornamental Scraping

The novice cannot hope to compete with the professional in the finish of scraped work. In particular, the beautiful "curled" effect, which is so often a feature of professional work, is most difficult to achieve, and is the result of long practice. It is done with a peculiar "lifting-twist" very difficult to imitate ; in fact, professional scrapers of long experience seem to be quite unable to convey in words details of the technique.

Nevertheless, the amateur may obtain quite pleasing decorative effects by working to some definite pattern, such as the checker pattern suggested in Fig. 8, and shown in actual use in the photograph (Fig. 9) The checker pattern may be enlivened by a few diagonal scrapes at varying intervals.

Lubrication

The type of scraper detailed early on is suitable for almost all metals, including brass, aluminium, cast-iron and steel. Brass and cast-iron should be scraped dry, but alloys and steel may need a cutting lubricant such as the soluble oil used for turning purposes.

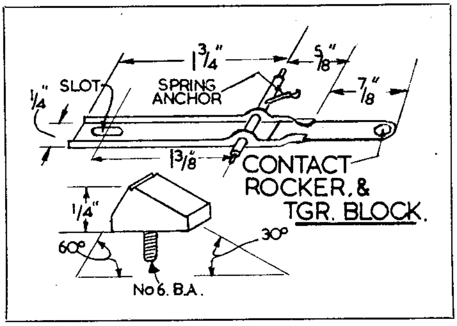
*A Half-seconds Electric Clock

by C. R. Jones

CONTACT pillars Nos. 3 and 4 were made $1\frac{3}{16}$ in. in length, and afterwards a small amount was turned off the lower end of pillar No. 3 to allow for the thickness of the insulating washer to be placed under this pillar later.

Both these pillars were drilled diametrically at $\frac{15}{16}$ in. from their lower ends to No. 4 B.A. tapping size, and were tapped with this thread for the contact-screw and the stop-screw.

Both ends of both pillars were drilled and tapped No. 6 B.A. in a similar manner to pillars 1 and 2.



Pillar No. 3 was fitted with a short length of No. 4 B.A. screwed rod with a slot for the use of a screwdriver in one end, and in the other end a hole was drilled and a short length of silver wire was inserted and sweated into position ; this was the adjustable contact.

Pillar No. 4 was also fitted with a No. 4-B.A. set-screw to act as an adjustable stop.

No. 3 and 4 pillars were fitted with a No. 6-B.A. set-screw at the top, to be used for locking the adjustable contact and stop-screw.

Contact Rocker

The trough portion of this was constructed of mild-steel 0.030 in. thick. The same procedure was used as for the " Contact Spring Assembly " of my last clock, except that $\frac{1}{4}$ in. square steel was used for forming purposes instead of $\frac{5}{16}$ in. square.

The spring carrying the silver contact was made from a piece of clock spring about 0.016 in. in thickness and $\frac{1}{4}$ in. in width, and was gripped in position by the sides of the trough being hammered over the end of the spring as shown. It was also soft-soldered in order to make good electrical contact.

A piece of silver about $\frac{3}{16}$ in. in diameter, was soldered where shown on top of the spring.

The sides of the trough were finished to about 3/32 in. in height, except where the two humps are shown, which enable an $\frac{1}{8}$ in. diameter hole to be drilled to just clear the bottom of the trough.

This hole is to accommodate the pivoted spindle, the $\frac{1}{8}$ in. portion of which is $1\frac{3}{16}$ in. in length, both ends being reduced to form pivots $\frac{1}{16}$ in. in diameter and 3/32 in. in length.

In the present case a $\frac{1}{16}$ in. diameter hole was drilled in the $\frac{1}{8}$ in. diameter portion of spindle to receive a spring anchor hook, similar to the one before mentioned as fitted to contact pillar No. 2, and in a position to line up with it.

The spindle was fixed to the trough portion of the rocker by means of a spot of soft solder, when in the correct position.

A slot about $\frac{3}{8}$ in. in length, and of clearance width for the No. 6 B.A. stud in the trigger block, was drilled and filed where shown in the left side of the bottom of trough.

Trigger Block

This was made from a piece of $\frac{1}{4}$ in. square silver-steel, to about the angles shown and is about $\frac{3}{8}$ in. in length. It is fitted with a No. 6 B.A. stud as shown, and was made and hardened, as described for the one in my last clock article.

Assembly of Pendulum Motor

Having now made all the parts of the driving portion of the clock, these were assembled, and the pendulum got going.

First the main frame was secured to the backboard so that the two dial centres, shown on the drawing, coincided. It was fixed by three $\frac{3}{16}$ in. diameter countersunk set-screws with the nuts at the rear of the backboard.

The pendulum-rod was assembled, complete with suspension spring, trigger support and trigger.

The pendulum bob was slid on the lower end and secured by the rating nut (an ordinary No. 2-B.A. nut in this case).

Another nut was now threaded on bottom of rod, and the armature screwed on flush with the end, this then being firmly locked by the nut, so that the armature was at right-angles to the backboard when the pendulum was placed in position on its supporting bracket.

The portion *C* main frame was then assembled, the pillars (1, 2 and 4) being secured in position by means of No. 6-B.A. cheese-headed set-screws and washers.

A small insulating bush had been made to fit the $\frac{3}{16}$-in. hole for No. 3 ; the centre hole in bush being No. 6 B.A. clearance.

Pillar No. 3 was then assembled with an insulating washer under it, by means of another No. 6 B.A. set-screw, metal washer, and another insulating washer underneath portion *C*.

The trigger block was now placed in position, with the stud through the slot in contact rocker,

**Continued from page* 692, " *M.E.*," *May* 29, 1952.

and secured by means of a No. 6-B.A. nut, and a small washer.

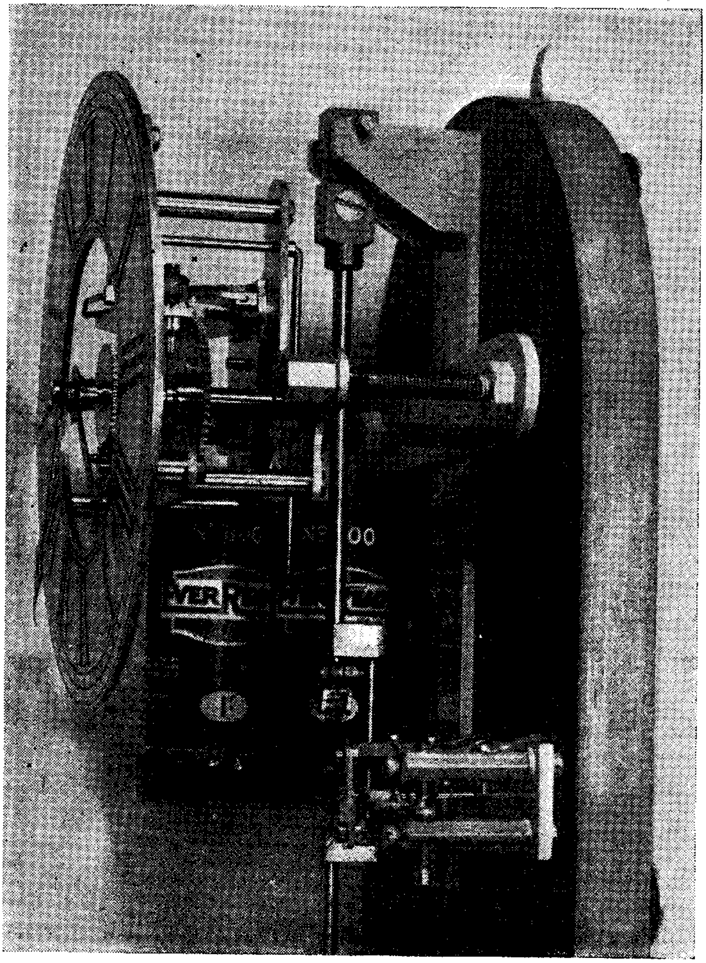
The rocker spindle having been inserted through its hole (but not yet soldered), the small outer bearing plate was placed in position and secured by two suitable screws.

The contact-screw, and the screw stop, were now screwed into position in pillars 3, and 4 together with their securing set-screws.

These pillars were then carefully lined up so that the contact-screw and the stop-screw were in line.

The contact on rocker spring was then brought central with the silver contact on contact-screw, the rocker spindle then being marked for the correct position.

The rocker spindle was then secured in the correct position, with a spot of soft solder, the rocker being removed for this purpose, and noting that the spring anchor was slightly above the horizontal and to the right.



Photograph No. 3. Side view of wheelwork

The rocker was then reassembled in its bearings, and the stop-screw adjusted so that it rested horizontally when touching this screw.

Pillar No. 2 was now adjusted so that its spring anchor was just below the horizontal position, and to the right, and a small tension spring hooked on to the two spring anchors.

The spring I used appears to be made of wire 0.012 in, in diameter and the coils are 5/32 in. in outside diameter, there being 18 of them ; the length of the spring including the ends is $\frac{1}{2}$ in., and it came out of a box of "Terry's" assorted tension springs.

This spring arrangement seems to work quite satisfactorily, and the tension can be adjusted to keep the contacts open by rotating pillar No. 2.

Portion *C* main frame was now secured in its proper position, by means of its two screws.

The pendulum bob was now adjusted by means of the rating nut so that the centre of the bob was about $9\frac{3}{4}$ in. from the underside of the portion *E*, and the pendulum was now placed in position on its suspension bracket.

The magnets were fixed to the backboard by means of two $\frac{3}{16}$ in. round-head set-screws and nuts, directly under the armature with the pendulum hanging vertically, and with about 0.035 in. clearance between the armature and the pole-pieces.

The trigger block was adjusted so that its notch was about $\frac{1}{8}$ in. to the left of the *centre* of the pendulum-rod, and the trigger so adjusted that it just rested in this notch when the pendulum was hanging vertically.

One pole of the battery was connected to one end of the winding on the magnets, the other end of the winding being connected to the insulated pillar No. 3, and the other pole of the battery to pillar No. 1.

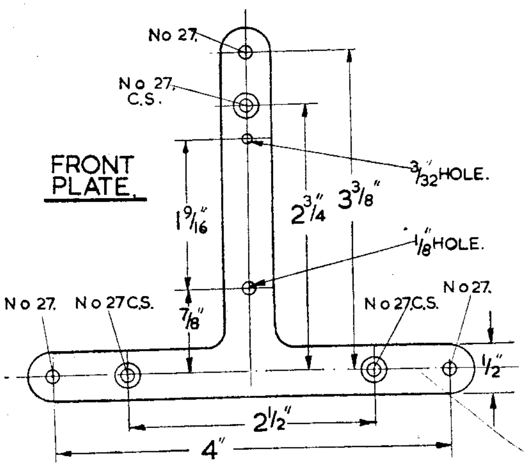
Both these pillars have been drilled and tapped and fitted with No. 8-B.A. screws to enable these connections to be made.

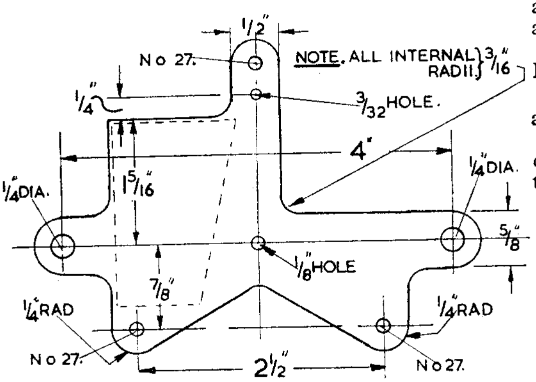
To make sure that the rocker made proper electrical connection with pillar No. 1, a short flexible lead was solder to near the pivoting point of the rocker, and was connected to this pillar. The contacts were adjusted to have a gap of about 0.006 in.

Having carried out these adjustments, the pendulum was started and found to work satisfactorily, and the swing was adjusted so that it was about $1\frac{1}{2}$ in. measured at the centre of the armature.

This can be increased by moving the trigger block to the left, and decreased by moving it to the right.

The pendulum was left to run, and a start was made on the wheelwork.





REAR PLATE.

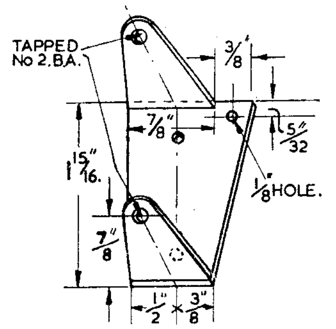
Plates

The plates were made from sheet brass about $\frac{1}{16}$ in. in thickness, and it will be seen that they are much simpler in shape than those of the last clock, and are much easier to mark and cut out.

All necessary dimensions are given on the drawings, and in the present case, after marking-out, all internal radii were formed by drilling $\frac{3}{8}$ in. diameter holes in these positions, small pilot holes being first drilled. The rest of the cutting was accomplished with a hacksaw, and finished off with files, etc.

They were then clamped together and all holes drilled common to both plates, the other holes being drilled when separated.

If brass is not available, they could be made of other suitable material, and the holes for the centre spindle, and the 3/32 in. diameter holes for the crutch spindle, bushed with brass plugs, as described for the rocker spindle hole in *C* main frame.



COUNT WHEEL BRACKET.

Count Wheel Bracket

In the present case this bracket was made up from three pieces, which were joined by silver-soldering.

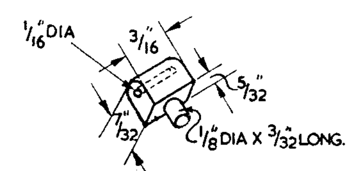
If desired, it could be bent up from one piece.

The count-wheel and its spindle was mounted in No. 2 B.A. studs, drilled $\frac{1}{16}$ in. in diameter and secured with nuts, as in the last clock (see article).

Backstop Bracket

This was cut and filed up to the sizes shown, after the small spigot had been turned.

The $\frac{1}{16}$ in. diameter hole for the pawl, was drilled before riveting the bracket in position in the $\frac{1}{8}$ in. diameter hole in count-wheel bracket,



BACKSTOP BRACKET.

a short length of $\frac{1}{16}$ in. diameter silver-steel being inserted into the hole while riveting, to stop the hole being squashed out of shape; a light hammer being used.

Count-Wheel and Spindle

The count-wheel has 60 ratchet teeth, and is $1\frac{1}{2}$ in. in diameter, and was made from a piece of brass $\frac{1}{8}$ in. in thickness, a brass boss being turned up and riveted into its centre.

The worm has 12 t.p.i. and is similar to the one in previous article.

The spindle was turned from $\frac{1}{8}$ in. diameter silver-steel, and the ends pivotted.

(To be continued)

Novices' Corner

Mounting End-mills in the Lathe

THE end-mill is, perhaps, the type of milling cutter most commonly used in the small lathe, for with it a great variety of machining operations can be carried out, and accuracy, together with a good finish, can be obtained, provided that certain rules are observed.

Many small lathes are ill-adapted for serious milling because of lack of stiffness in the mandrel and its bearings, and also by reason of insufficient rigidity in the machine slides. The end-mills used in small lathes usually do not have a diameter greater than $\frac{1}{2}$ in.; this means that the cutter can be run at a fast or medium speed, even when machining steel or cast-iron, and it should be possible to take a fair depth of cut without chatter.

The end-mill, when mounted in the mandrel chuck, lacks the support of the tailstock centre normally provided for cutters carried on an arbor; it is, therefore, important to make the mounting as rigid as possible; for any whip in the mandrel itself or slackness in the bearings will allow the cutter to be deflected during machining, and digging-in and chatter may result. The second important requirement is that the end-mill should be accurately centred to give true running.

If the cutter runs out of truth, the burden of the work will fall on a few teeth only and the machining will, therefore, be slowed. Furthermore, an eccentrically mounted cutter will cut oversize and cannot be relied on, for example, to machine a keyway to the intended width.

The end-mill can, of course, be accurately centred in the four-jaw chuck by employing the test indicator to check the setting; when doing this, the contact point is applied to the cutter teeth while the mandrel is slowly turned by hand in the reverse direction.

If a small four-jaw chuck is used, the overhang will at the same time be reduced. The self-centring chuck, on the other hand, has a greater overhang, and its error of centring is often too great for mounting end-mills to cut efficiently.

To reduce the overhang to a minimum and, at the same time, to obtain accurate centring, it is advisable to use some form of mandrel collet chuck. The hardened mandrels of precision lathes are usually adapted to take split collets, which are closed to grip the work by being drawn in against a taper by means of a threaded draw bar.

This arrangement can also be used where the mandrel nose is formed with a Morse taper bore for housing the ordinary conical centres.

Messrs. Myford manufacture sets of patented

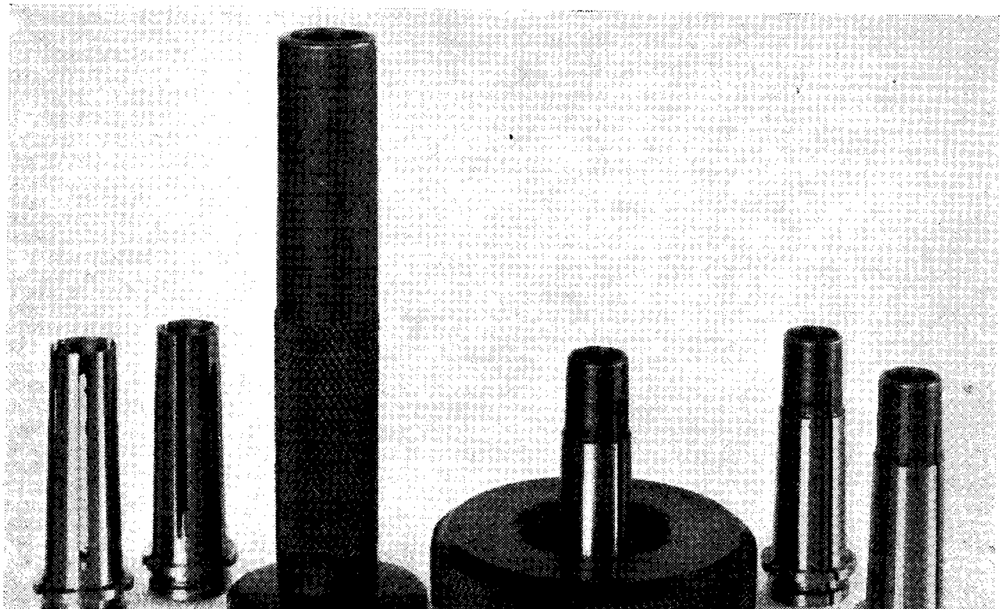


Fig. 1. The Myford collet-set with mandrel nose ring and extractor

collets for use in the No. 2 M.T. nose of the M.L.7 lathe and also for the No 1 M.T. of the Drummond-Myford lathe. For the larger taper, the collets have a holding capacity ranging from $\frac{1}{8}$ in. to $\frac{1}{2}$ in., and the smaller set will hold from $\frac{1}{8}$ in. to $\frac{3}{8}$ in.

Collets of this kind enable turned work, arbors, and cutters to be quickly and accurately centred, and, as an end-mill mounted in this way projects for only a short distance beyond the mandrel nose, the overhang is greatly reduced.

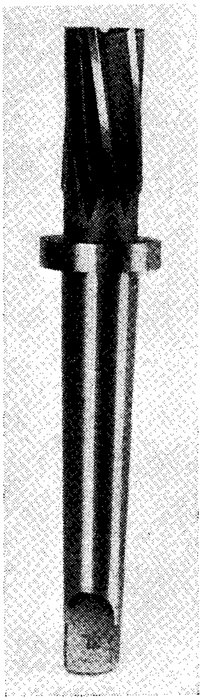


Fig. 2. A $\frac{1}{2}$ in. end-mill fitted with mounting collars

The knurled collar, seen in the illustration, screws on to the mandrel nose, and by pressing the split collet inwards contracts it to grip the work. This collar also engages with a groove formed in the end of the collet and so serves for withdrawing the collet from the mandrel taper. In addition, the collets can be readily removed from the collar by using the tubular extractor provided.

End-mills are, however, also manufactured with Morse taper shanks, and this pattern, made of high-speed steel, can at times be bought quite cheaply as war surplus material.

When mounting this type of end-mill in the lathe mandrel, it is advisable to secure the cutter in place by means of a draw bar passing through the mandrel bore, but once the shank has been hardened, it cannot readily be threaded, particularly where the material is high-speed steel. The end-mill can be seated by tapping it lightly with a piece of wood, but it must never be driven in, or much damage may be done to the lathe. Conversely, the cutter can be removed without doing damage if a length of brass rod is passed into the mandrel bore from the tail end, and then bumped against the cutter shank with the fingers.

A cutter, mounted in this way, may hold as long as there is sufficient cutting pressure against its end face, but if the cut is taken on the side face only, the shank may quite well loosen in the mandrel taper.

It so happened that, recently, some end-milling had to be done on tough material using high-speed steel cutters with Morse taper shanks, and the following method of mounting was adopted to obtain a secure hold without the danger of the end-mill coming loose and spoiling the work.

On measuring the $\frac{1}{2}$ in. end-mill with the micrometer, it was found that the diameter of the neck portion between the teeth and the end of the shank was 0.451 in.; also, the diameter

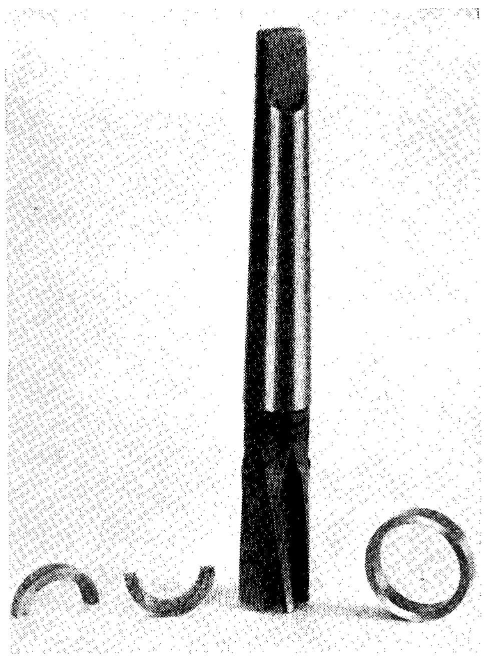


Fig. 3. The end-mill with its two collars removed

of the large end of the taper was 0.481 in. This gave a shoulder 15 thousandths of an inch in depth for securing the cutter.

A ring was then turned from a length of $\frac{5}{8}$ in. dia. mild-steel with a bore equal to the diameter of the cutter's neck. Next, a second collar or keep-ring, was turned to fit over the first.

The internal ring was then divided into two equal segments.

To mount the end-mill in the lathe, the split ring was placed on the neck of the cutter and

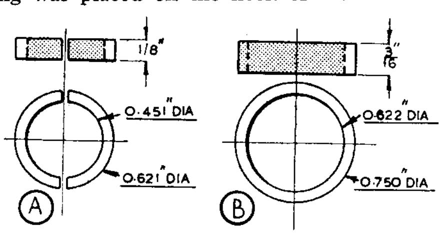


Fig. 4. Showing details of the two mounting rings

was kept in place by slipping the second ring over it, as shown in the photograph; the assembly was then inserted in the mandrel taper after the parts had been carefully cleaned.

The knurled collar belonging to the Myford set of collets was, next, screwed on to the mandrel nose, and this, by bearing on the inner ring surrounding the cutter neck, pressed the tapered shank firmly into place. During an hour's heavy machining, the end-mill remained securely held, but was afterwards easily removed with the aid of the brass bumper.

The "Granville Senior" $3\frac{1}{2}$-in. Lathe

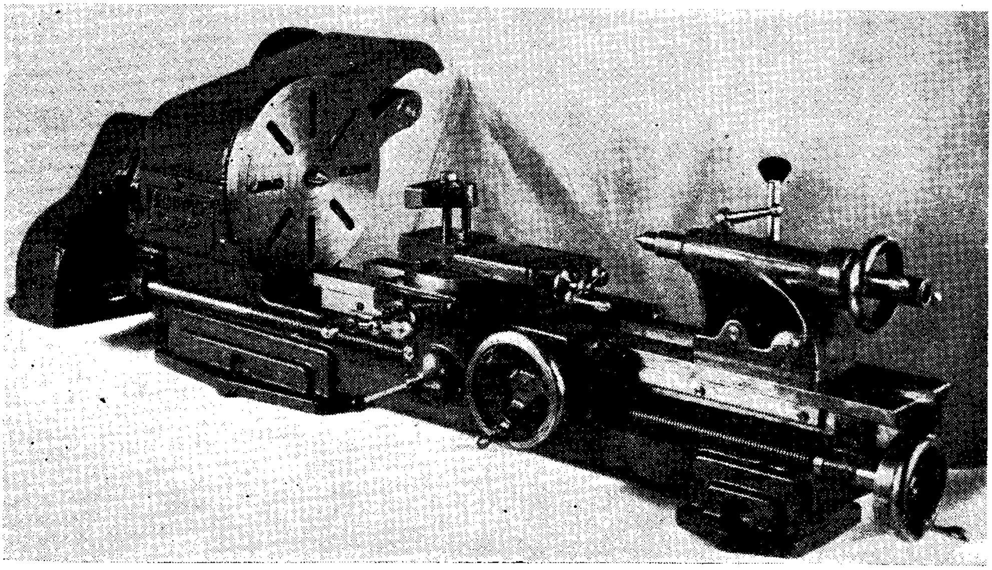
DURING the post-war period, British manufacturers of small lathes have made considerable improvements in their design, to bring them in line with the development of larger machines, which have to cope with increasingly exacting demands in respect of accuracy and rate of production. Even non-industrial users of small lathes now demand a much higher standard of quality and durability in their lathes than before the war. It is interesting to note that in making these improvements, the identity and traditional features of British lathes, which make them second to none in versatility and general usefulness, have been steadfastly maintained.

New Details

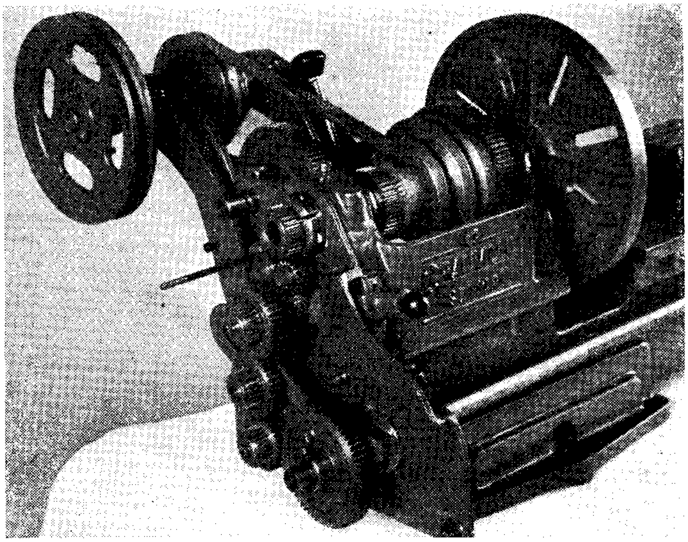
Several novel and interesting details of design are seen in a new $3\frac{1}{2}$-in. lathe, which we have recently examined, produced by Messrs. F. Coals, Ltd., of Woodford Green, Essex. Although the name of this firm may be unfamiliar to many of our readers, they are by no means new to machine tool manufacture, having produced lathes, shapers, milling machines, etc., for many years, and their "Granville" lathes have featured in the advertisement pages of THE MODEL ENGINEER during the post-war period. Their new lathe is a very definite advance on the type previously advertised, though the latter will not be rendered entirely obsolete by its introduction; it will, however, be known as the "Granville Junior," as distinct from the improved "Granville Senior" now to be described.

Improved Structure

The most obvious improvement in this lathe is a general stiffening up of its structure, including larger mandrel dimensions, wider and heavier bed, with increased bearing surfaces on all slides. No die castings are used in any of its components. It has a maximum distance between centres of $21\frac{1}{2}$ in., and will swing a clear 9 in. diameter in the gap. The headstock bearings are of the "half-split" type, with phosphor bronze bushes, fibre shims being fitted in the split, to conserve oil, and allow of firm tightening of bolts with correct running adjustment. The mandrel nose is screwed $1\frac{1}{8}$ in. by 12 t.p.i., with a $1\frac{1}{4}$ in. dia. parallel register. A special feature is the large size of the bearings, the front bearing being $1\frac{3}{4}$ in. internal diameter by $1\frac{9}{16}$ in. long, and the rear bearing $1\frac{3}{8}$ in. diameter by $1\frac{9}{16}$ in. long. A ball thrust race is fitted, and end play adjustment is by means of a screwed split collar, with locking screw. The usual three-speed drive pulley is fitted to the mandrel, with plunger type clutch for direct drive, and the backgear is of the conventional type, brought into engagement by endwise movement of its shaft, which is grooved to take a locating pin in two positions.



The "Granville Senior" $3\frac{1}{2}$-in. lathe



End view of headstock, with belt and gear covers removed

The lathe bed is flat, with square shears, the saddle being located on the outside of the shears and the tailstock between them. A long cross-slide is fitted, equipped with T-slots to serve as a boring table, and a socket to locate the spigot of the swivelling top-slide, which is secured by symmetrically disposed T-bolts front and rear. The toolpost is of the single stud type, with a heavy triangular top-plate, and jack screw for rear adjustment.

The Tailstock

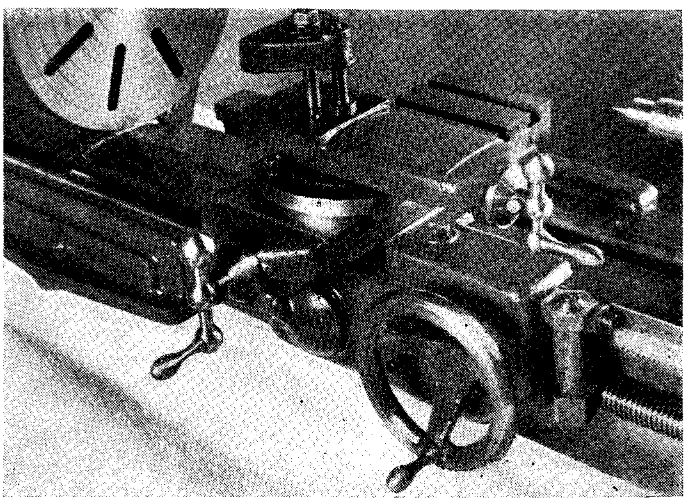
This is of the hollow barrel type, and is provided with set-over adjustment, controlled by screws at the front and rear. It has a quick-action eccentric locking device, with hand lever, and the barrel lock is of the split clamp type, also with hand lever. The barrel is 1 in. diameter, and both mandrel and tailstock sockets are No. 2 Morse, with a through bore of $\frac{9}{16}$ in. For screwcutting, the normal arrangement of clasp nut is fitted to the saddle apron, and rack-gear is provided for quick traverse. The leadscrew is $\frac{3}{4}$ in. diameter by 8 t.p.i., and may be provided with a graduated hand-wheel for fine hand traverse, as an extra. Both the cross-slide and top-slide feed-screws are equipped with adjustable indices.

The motor drive equipment consists of a cast bracket attached to the rear of the headstock, carrying a plain bearing countershaft with three-speed vee-belt pulley and primary motor drive pulley, also motor mounting bracket. Belt tensioning is by means of self-locking cam action device, with hand lever.

Standard equipment includes a 9 in. faceplate, 4 in. driving-plate, one soft live centre, one stellite-tipped back centre, a set of eleven change wheels, 20 d.p., 20 to 65 teeth, covering all standard Whitworth and B.S.F. threads and normal self-act feeds, and screw-cutting chart. Extra equipment can be supplied, such as fixed and travelling steadies, vertical-slide, screw-cutting indicator, and change wheels up to 127 teeth, the latter enabling metric threads to be cut.

Seen at the Works

Besides inspecting specimens of this lathe, we have also been privileged to see its components under construction in the factory. The methods employed are typical of modern machine tool production practice, and include operations such as slideway grinding, precision boring of headstock housings in special jigs, gear hobbing, and graduating indices; in many cases specially adapted machines or fixtures are employed. The factory premises are at present being extended to cope with increasing production demands, which have already exceeded expectations, and include large export orders. The sole distributors of the "Granville Senior" lathe are The Burnett Machine Tool Co. Ltd., Burnett House, Myton Gate, Hull.

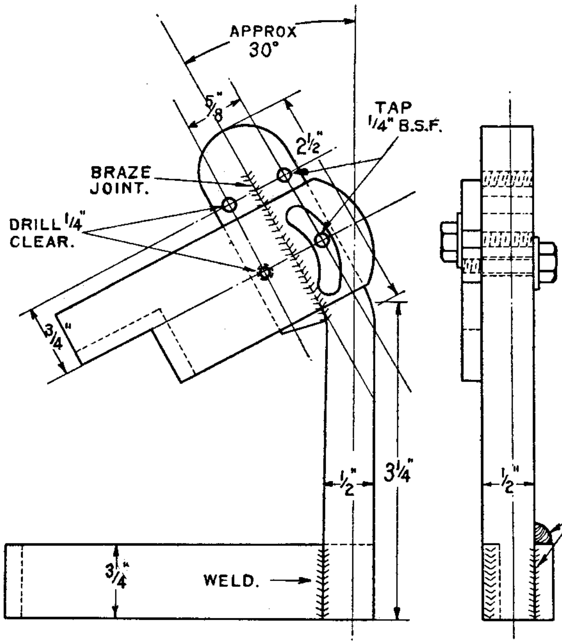


The saddle and compound slide-rest, with screwcutting indicator fitted

A TRAVELLING STEADY

by W. R. Silvester

A TRAVELLING steady for your M.L.7 for a couple of shillings, or if one has the use of a welding outfit, "Uncle Alda" will cut the cost to a few pence!

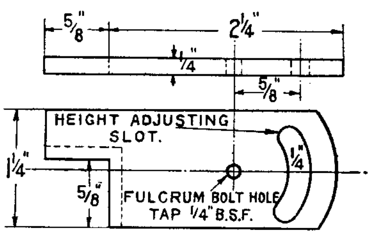


Having recently purchased one of these fine machines and worked out some of my excitement, I had a job to do where a travelling steady was an absolute necessity, to wit, making a boring bar. Yes, it meant a steady and anything over a "note" was out of the question.

I found in the proverbial junk corner a piece of $\frac{1}{2}$ in. $\times$ $\frac{1}{2}$ in. square mild-steel bar which was originally a motor-car jack-winding handle, also a piece of $\frac{3}{4}$ in. $\times$ $\frac{3}{16}$ in. strip that was salvaged from a perambulator.

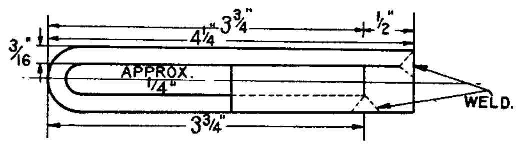
I bent the piece of $\frac{3}{4}$ in. strip into a tight U, placed a piece of $\frac{1}{4}$ in. thick strip in the U and squeezed it up in the vice, thus leaving a $\frac{1}{4}$ in. wide gap between each "leg." It was then cut to length, one "leg" being $\frac{1}{2}$ in. larger than the other. If it is cut at an angle it will be ready for welding all in one go; saves filing!

The $\frac{1}{2}$ in. bar was taken and heated about 2 in. from one end, bent round sharply and flattened against the larger part, thus making a $2\frac{1}{2}$ in. $\times$ 1 in. $\times$ $\frac{1}{2}$ in. "knob" on one end, the joint being brazed through to make it solid. Chamfer off the two opposite corners of the $\frac{1}{2}$ in. bar at the bottom for $\frac{3}{4}$ in. up (as per drawing) to enable a good weld to be made when joining the base to the upright part. When the welding has been done, heat the upright part just below the "knob" and bend forwards and downwards to about 30 deg. from the vertical. Now file it all up clean and get the base really square and straight.



Now we come to the steady arm. Three inches of $1\frac{1}{4}$ in. $\times$ $\frac{1}{4}$ in. or $\frac{3}{16}$ in. will do the job. Centre-pop the single hole as per drawing (we will call this the fulcrum hole); $\frac{5}{8}$ in. from there, with the dividers, scribe a line across the metal and mark off four equidistant centre-pops to make the height-adjusting slot. Drill these four holes $\frac{1}{4}$ in. dia., clamp metal in vice and chisel out the little "bridges" between the holes and file out neatly to make a nice curved slot. Drill the fulcrum hole to tap out $\frac{1}{4}$ in. B.S.F. Cut one corner as per drawing, and build up with brazing rod and file out square, or if not convenient, the whole piece can be made from phosphor-bronze.

Mark off the holes in the steady arm carrier, and drill the fulcrum-bolt holes to tap $\frac{1}{4}$ in. B.S.F. The reason is obvious when one sees that the bolts go in opposite ways; the distance between the holes is not great enough to prevent the washers under the bolt heads overlapping.



The adjustment is carried out—lower holes and steady forward to smaller diameters, upper holes and steady backward for large diameters. The steady is ideal for any amateur turner who is, in most cases like myself, always in need of cash to carry on, as the wife says, *mucking about in your old shed*!

PRACTICAL LETTERS

Power Plant for a Model Launch

DEAR SIR,—The photograph shows a power plant for a model launch which I have recently completed. It includes a single-acting steam engine of $\frac{3}{4}$ in. bore $\times$ $\frac{3}{4}$ in. stroke made mainly from scrap, no castings being employed. Some of the working parts, including the connecting-rod, trunk piston and eccentric strap were retrieved from an earlier effort which, incidentally, was described in the pages of THE MODEL ENGINEER some years ago.

The principal dimensions of the engine are as follows: column centres, fore and aft $1\frac{1}{8}$ in. apart, athwartships $1\frac{7}{16}$ in. apart; length of columns between soleplate and cylinder flange $1\frac{3}{4}$ in.; boiler, 2 in. diameter copper tube, 6 in. long with two water-tubes fitted.

Sheet aluminium is employed for the boiler casing, and the engine frame-work, also the soleplate.

The overall length of the plant is $14\frac{1}{2}$ in. and the maximum width $4\frac{1}{4}$ in. The plant performs well under steam and has given good results in a model power boat.

Yours faithfully,

Greenock. WILLIAM WHITE.

Hipp Electric Clock

DEAR SIR,—I was interested in your reply to Query No. 9955. I made a $1\frac{1}{2}$ seconds pendulum clock with Hipp movement, from the design of Mr. Jones, described in THE MODEL ENGINEER of January-February, 1950.

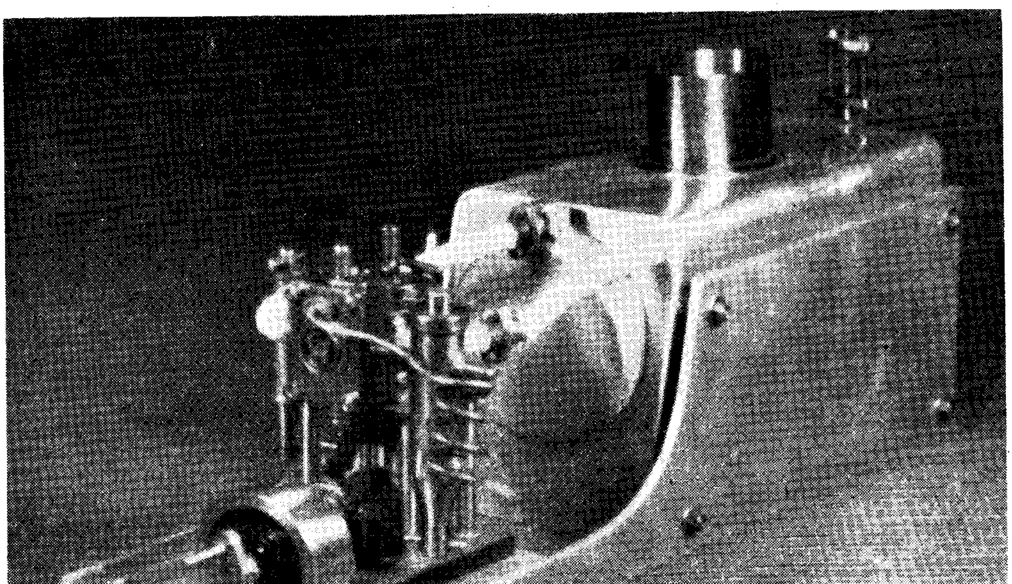
At that time I could not obtain spring steel for the suspension, so used hard rolled brass instead. After three months' swinging, this cracked and the pendulum dropped. I therefore substituted a suspension incorporating a small ball-race and the clock has been going ever since.

There is no trace of any elliptical swing mentioned by your querist nor any pulling down of the armature on to the magnet.

The only trouble I have had is an occasional "thump" when a contact is made, and up to now I have been unable to discover the cause of this. Also, I have not been able to achieve so large a number of pendulum swings per contact as Mr. Jones does; mine is 28-30 swings (45 seconds) on a new battery and, of course, driving the clock. The clock has functioned and given accurate time for more than a year.

Yours faithfully,

St. Neots. H. P. EMSLEY.



Mr. W. White's marine steam power plant

A "Duplex" Hacksaw Machine

DEAR SIR,—This machine (lathe model) is now completed and in working order. It has proved to be most efficient and will eliminate a lot of hard work with the hand-saw. I have demonstrated its capabilities to several friends of mine, who were greatly impressed both by the performance and the design.

The original design by "Duplex" was adhered to, great care being taken to make everything, except the base mounting, exactly as described, and taking plenty of time on the job. This has been well worth while. Obtaining the necessary material was, of course, difficult. The baseplate had to be $\frac{3}{8}$ in. instead of $\frac{1}{2}$ in. thick, although I think $\frac{3}{8}$ in. is quite suitable. The machine was mounted in the centre of the baseplate on two mild-steel angles, the plate being cut out to clear the crank and pivot-arm. This makes a better balanced job, gives plenty of room for manipulation of the vice, and the machine will stand up on its own. I use an "Adept" machine vice, without any modifications to it. This vice is stronger and more suitable than the "Myford," although not quite so accurately made. The baseplate is secured by four small bolts to a length of hard wood the same size as the baseplate. An alignment strip of wood is secured under one end and the machine is held by two bolts in one of the slots of the lathe cross-slide. To allow the blade to clear the base of the vice I placed a couple of large washers on the stop bolt. Later on I shall probably put a piece of plate under each of the angle brackets to eliminate the washers.

The weight was made from an old electric clock weight (a brass tube filled with lead). This was of the correct diameter, so I cut off a 3 in. length, melted out the lead into a ladle, fitted the original end-plates, with bushes to fit the weight shaft, and a piece of gas tubing inside. A 1 in. hole was made in the side of the tube. The tube was then placed on the family scales and lead poured in through the 1 in. hole until the 3 lb. mark registered on the scales. A flanged collar was riveted to one end-plate and a set-screw through this secures it to the weight shaft.

Regarding blades, I find no difficulty in breaking these to the length required. I use two pairs of pliers for the job, taking care that the blade is gripped clear of the teeth, i.e. don't grip the teeth with the pliers. A little practice on old blades soon inspires confidence. It probably will not pay to commence straight away on H.S.S. blades at 1s. 8d. each. I use these blades only for really tough jobs, the ordinary blades being quite suitable for other work. Why H.S.S. blades cost 1s. 8d. each I fail to understand. Carbon-steel blades can be obtained for 3d. each.

Incidentally, I run the machine from the low direct drive on the lathe. This is quite satisfactory and does the job very well without detriment to the machine or the lathe. The back-gear is far too slow.

On trying out the machine a nasty knock was heard as the crank revolved. This was found to be due to slackness in the lathe headstock bearing, and ceased immediately on taking up the slackness. This is accomplished on my old lathe by merely tightening up a single bolt. On some lathes this will no doubt entail a somewhat different procedure. If this knocking business is not rectified the lathe bearing will no doubt suffer damage.

Another point requiring careful attention is the alignment of the blade, particularly the tension adjuster. If the nut does not rest square with the end of the frame the blade is inclined to pull to one side. When the machine is not in use I slacken off the blade and push a wire paper clip on to the blade to remind me when using the machine again.

I noticed in your March 6th issue that another gentleman had made a larger model. This is very nice if you have the amount of work to justify its existence, and the room to accommodate it. The original design is, in my opinion, quite satisfactory, and a credit to the designer. My machine takes about two minutes to fix up, and when not in use stands on a shelf under the lathe.

Difficulty was experience in obtaining the ball-bearings, but I managed to find a firm who apparently had an unlimited stock, so if any of your readers want the name and address, I will supply it; also, if anyone would like to see the machine, I should be pleased to oblige.

Again thanking you for another really useful machine for my workshop.

Yours faithfully,
Leeds, Yorks. W. KIRKHAM.

Wheel Spin at Speed

DEAR SIR,—I read your paragraph on "Locomotive Slipping at Speed" in the May 1st issue, and I have a theory about the cause which may, or may not, be accepted by locomotive engineers.

If I pick up a stone and hurl it from me, at, say, a height of 5 ft. from the ground, it travels 5 ft. above the ground, *despite its weight*, until its velocity falls, then the stone gradually returns to earth.

Now, if I board a locomotive of so many tons (static weight) and open the regulator, the engine starts and accelerates in a horizontal direction. As the speed increases the weight pressing on the rails must gradually diminish until, if it were possible, a speed could be reached when there would be no weight at all on the rails.

To me the cause of wheel spin is due to the resultant force which reduces the adhesion of the wheels to the track. What do other readers think?

Yours faithfully,
Halifax. J. A. COCKROFT.

Double Pendulum Clock

DEAR SIR,—From the description you give of the little clock on the cover of "M.E." No. 2658, I think there is little doubt that it is fitted with the double pendulum escapement invented by Dutertre in 1726 for use on ships. It is illustrated and described in *It's About Time* by Paul M. Chamberlain. It is, of course, only one of innumerable modifications of the Verge escapement.

Yours faithfully,
Bognor Regis. C. COWPER-ESSEX.

Water Divining by Electricity

DEAR SIR,—In one of the issues of THE MODEL ENGINEER about 35 or 40 years ago I remember reading of a young man using a battery and galvanometer to find water.

Would it be possible after all these years to obtain details of this device, as I want to put it into practice and do not know the correct way to connect the battery.

Can anyone help me, as I want to use this apparatus after a water diviner, as a test.

Yours faithfully,
"OLD TIMER."
Devon.

Model Speed Boats

DEAR SIR,—Mr. T. W. Liddell, in his letter on the above subject, in the May 8th issue, has dug up a lot of old theories which have been argued to death in the past, and are mostly fallacious, anyhow; but one which cannot be allowed to pass unchallenged is his statement that these boats are not "models." I find that many readers of THE MODEL ENGINEER apparently have a similarly narrow conception of the definition of this word, and their attempts to find a substitute for it are a typical example of misguided energy. A model may be properly described as "a small imitation of the real thing," in the same way as a cabbage can be described as a vegetable; but it does not follow that all vegetables are cabbages, neither that all models must be imitations of larger objects.

The term "model" is legitimately applicable to all experimental machines and appliances, and in this respect the "model" speed boat qualifies with high honours. Models, so far from always being copies which trail a long way behind the original, can be, and often are, the first concrete materialisation of a new idea, which may have a profound effect on "the shape of things to come." Model engineers, whatever the particular line of construction or experiment they choose to follow, need never be ashamed to use the term "model" for the products of their hands and brains.

Yours faithfully,
"ARTIFICER."

Old Traction Engines

DEAR SIR,—At the present time on Victoria Dock, Hedon Road, Hull (behind St. Peter's Church, a bombed building), there are lying some 18 traction engines of all types and practically of every make, including a Fowler ploughing engine, a sight worth seeing.

These traction engines have been collected at this point for shipment abroad, but this shipment has been held up.

Yours faithfully,
G. S. SHEPHERDSON.
Hull

CLUB ANNOUNCEMENTS

P.A.D.S.M.E.E.

At the recent general meeting of the above society, a very interesting and informative talk was given by the treasurer, Mr. W. A. Hutchings, on the subject of "American Rolling Stock."

With the aid of scale models, and projected illustrations, Mr. Hutchings traced the evolution of this, from the early English style to the now familiar and distinctive American pattern.

The railway section are now engaged in constructing a new gauge "OO" layout; whilst the newly-formed model car section have commenced work on a racing track. Both of these items will be on show during October, when the society will be holding another exhibition, this time at the Corn Exchange.

Hon. Secretary: J. HAMMOND, Hill House, Hannafore, Looe, Cornwall.

The Tees-side Society of Model and Experimental Engineers

At a meeting held on April 24th, the Tees-side members were delighted to welcome a team consisting of Messrs. J. Murta, H. Swaine and N. J. Mellentin, of the Sunderland Society, and to listen to their talk on "Model Locomotive Construction."

Mr. Murta dealt with his section of the combined talk and expressed his opinion that beginners would be well advised to tackle a free-lance locomotive of the Atlantic type rather than, say, a four-coupled tank, and he gave his reason that a Walschaerts valve gear is actually easier to construct than is an ordinary link motion and also that an Atlantic is likely to have a larger firebox, and is, therefore, easier to tackle. He also gave very interesting tips on setting-up for "dead centres" and for machining various parts.

Mr. Swaine dealt with boiler construction and his long experience and dry humour made his talk doubly attractive; he knows something of auctioneering, but he never did more pleasing spellbinding as an autioneer than at this talk He described the various processes in constructing a model boiler and he made it appear so easy that some of his listeners must have wondered what went wrong with their efforts.

Several models were demonstrated in various stages of construction including at least one beautiful prize-winner at a local exhibition.

The home team were very grateful to the visitors for a very entertaining and successful meeting.

On May 13th, at its headquarters in Middlesbrough, the society held its annual general meeting. There was a good attendance, and matters of internal organisation were discussed and amendments introduced where necessary. The retiring officers were thanked for their services and new officers were elected, and the society is honoured in being able to retain the services of Dr. F. W. Hebblethwaite as president and Dr. W. H. Maclennan as chairman. Officers and members expressed their thanks to the many speakers who have contributed so much to their enjoyment and instruction by their lectures during the past year and particularly to speakers from neighbouring societies.

Hon. Secretary: J. W. CARTER, 28, East Avenue, Billingham, Co. Durham.

City of Leeds Society of Model and Experimental Engineers

Our programme for the next two months is:—

Wednesday, June 11th. Meeting at Mr. Cook's, Kidacre Street, Hunslet. "Erecting Our Track." All members who expect to assist with the track are asked to attend. A practical demonstration will be given to help our newer members.

Tuesday, June 17th. Ordinary meeting at Salem Church Institute.

Saturday, June 28th. Track at Clayton Firm's Sports Day on their Burton Road sports ground, Dewsbury Road.

Sunday, June 29th. Through the kindness of the management committee of The Clayton Sports Association we are leaving the track up on their ground at Burton Road so that we can have our own private use of it on this Sunday. Members and visitors will be welcome and the more locomotives the better. It is hoped to arrange refreshments in the afternoon.

Tuesday, July 1st. Ordinary meeting at Salem Chapel.

Saturday, July 12th. Track at Middlestown Carnival (Middlestown is on the Wakefield Road).

Tuesday, July 15th. Ordinary meeting at Salem Church Institute.

Saturday, July 19th. Track at Wellington Foundry Sports Club Field Day at their sports ground in Elland Road.

Saturday. July 26th. Track at Purston (Featherstone Carnival, Leatham Park Estate Children's Fund).

Visitors are welcome at any of our meetings.

Hon. Secretary: R. G. COLBRAN, 9, Church Wood Avenue, Headingley, Leeds, 6.